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New Buffing Frames.

The accompanying cuts represent two styles of buffing frames built by the Union Stone Company, Boston, Mass.

The offset frame is designed more especially for buffing long pieces such as chandelier rods, brass rails, etc., the overhanging head allowing good clearance.

In both styles the journals are protected by dust caps over the ends of the boxes. The long spindles which carry the wheels out at some distance from the belts, is a feature which will be appreciated by practical polishers.

The company state that though the design shown has been adopted as standard for these machines, it may be changed to suit the requirements of purchasers, either in pulley arrangements, length of arbor, or size and shape of the ends of spindles to receive the polishing wheels.

Wilson's Spark Arrester.

Mr. Wm. Wilson, superintendent of machinery of the Chicago, Alton and St. Louis Railroad, has invented and put into use upon that road a spark-arresting device, which is pronounced much more thoroughly effective in preventing spark throwing than anything else yet devised.

The lower part of the front of an ordinary smoke-box is cut out, and projecting slightly into the opening so made is a triangular shaped box, most of this box being below and in front of the smoke-box. On the inclined front of this box are two hinged valves which can be opened from the cab to admit air to the box while running, and the same motion which opens them works a valve inside which shuts off communication with the smoke-box. Deflecting plates are so placed as to lead all sparks into this box, and it can be emptied while running, by opening the air valves and drawing the sparks out through pipes connected to the box at the lower rear corners and running back under the fire-box.

A small steam jet is used in these pipes to counteract the effect of the smoke-box draft and to draw out the cinders when the air valves are opened.

Hot Air Heating and Ventilation.

John Walker, manager of the Walker Manufacturing Company, of Cleveland, Ohio, read a paper at a recent meeting of the Civil Engineers' Club, of that city, on the system of heating and ventilating the company's works by hot air. The works are scattered over seven acres of land, and it became a problem of some difficulty to heat them satisfactorily. The process now employed was adopted for the work by Mr. Walker. Air is taken into a blower from outdoors, passes over a coil of steam pipe, and is forced through earthenware conduits underground, for several hundred feet. Last winter the method was tried for the first time, and it was successful beyond the expectation of its projector. In the summer the air is forced through the pipes without submission to the steam radiator, and cools the air in the different departments several degrees below the outdoor temperature. With this system it is possible to keep an equable temperature in the works summer and winter. The advantages of the system are economy, good ventilation and convenience. So far as known, this method has never been used in the heating of factories before, though it has been applied to public buildings. The entrance of a strong current of warm air, and its tendency to carry up with it all impurities, keeps the factory free from smoke and the air wholesome. The pipes, in passing from one building to another, pass under open ground for several hundred feet. It was noticed last winter, when the blower was first turned on, that no heat reached the opening at the further end. As soon as the ground became heated, the air entered the building heated. When snow fell, it was melted for a space of eight feet across the pipes, which are buried four feet. In the hot weather last summer the temperature was kept at least 10° lower, by means of the air blast.

NEW BUFFING FRAMES.

An immense machine tool has recently been built in France for the naval department. It is termed a lathe, but appears to be capable of almost any heavy machine work. The weight of the machine is 340 tons, and it requires a 25 horse-power engine to drive it.

Delaying the Issue of Patents.

BY R. G. DUBOIS.

It is true that, by proper management, an inventor can keep alive his right to a patent for an indefinite period, and this notwithstanding the invention may have been on sale or in public use for over two years before the grant of the patent. This may be done by amending the case once in every two years. The general impression of the public seems to be that such a course is highly advantageous to the inventor, because it prolongs his monopoly. But this, however, is not the case, as an inventor's monopoly does not begin until the patent issues, and it ends permanently at the expiration of seventeen years, and cannot be renewed except by special act of Congress.

An application for a patent affords an inventor no more protection against public use of his invention than if he had filed no application at all. Many inventors have an idea that an invention can only be abandoned to the public by two years' public use of the same before filing the application. This is a great mistake. That is only one way of abandonment. Another way is pointed out by statute, so far as particular machines, articles or products are concerned. If, while an inventor's application is pending before the Patent Office, another person makes, uses or sells the invention with the knowledge and consent of the inventor, he will have the right to continue the use of the particular article he has thus made, even after the patent has issued. (Section 4,889, Revised Statutes.)

Another way of abandoning an invention generally to the public, pending an application, is by conduct. For instance, if, during the pendency of a long drawn out application, an inventor quietly and knowingly acquiesces in the use of his invention by the public generally, or in public by particular persons, say for two years, in the meantime exercising no diligence in the maintenance or prosecution of his supposed rights, there is no court in the land that would now sustain his patent, when obtained, against such use. A person can dedicate his invention to the public at any time; and the courts have held, and are inclined to hold still more strictly, that such dedication may be implied by conduct, as well as by express dedications in language.

No inventor can afford to sleep on his rights. The whole policy and spirit of the patent laws are against it. The United States Supreme Court, in the case of Kendall *vs.* Windsor (21 Howard, 322), says that the ultimate object of the patent laws is to benefit the public by the use of the invention, after the temporary monopoly has expired; and one who conceals his invention, and uses it for his own profit, is not entitled to favor, if another person should find out and use the invention. But this does not include the inventor who forbears to apply for a patent until he has perfected his invention.

Again, that an inventor "may forfeit his rights by a willful or negligent postpone-

ment of claims, or by an attempt to withhold his improvements from the public until a similar or the same improvement should have been made and produced by others."

On the other hand, if diligent in asserting their rights, inventors are entitled to protection against frauds and wrongs practiced to pirate from them the results of the thought and labor of, perhaps, years.

The question as to whether an applicant has amended his case purposely to withhold his patent from issue, is one which is for a court or jury to determine; and it would be an easy matter to ascertain, by an examination of the records, whether or not due diligence had been used in prosecuting the case. For instance, suppose the records showed that the Patent Office had requested another view to be added to the drawings, to better illustrate the invention, and the request was not heeded until some twenty months afterwards, and such practice continued, and that, during this time, the inventor and others were selling large numbers of the device. This should convince a court or jury immediately that due diligence was not used, and a judgment would be rendered accordingly.

While an application is pending in the Patent Office it is also exposed to more or less danger, because another person might file an application for the same thing, and an interference would be declared; and then the last applicant might prove that he made sketches of the invention prior to the first applicant, and thereby obtain judgment in his favor. While an application is pending, judgment is often awarded the one who proves to be the first to show and describe the invention by sketches; but in order to defeat a patent already issued, it is necessary to produce something more than sketches. The applicant must prove that a working device was made and operated by him prior to the patentee's invention. This is a much more difficult task than to prove priority, simply by sketches, as against an application.

It is evident, therefore, that anyone who delays the issue of his patent for the purpose of prolonging his privileges is taking a great risk, and making himself liable to embarrassments after the patent has been issued; and that the man in possession of a patent diligently obtained stands a much better show against pirates than the one who only has an application pending in the Patent Office.

The Alignment of Line Shafts.

By Fred. J. Miller.

In many kinds of manufacturing the power required to merely overcome the friction of the line shaft constitutes a considerable percentage of the entire power used by the plant, and it is partly for the purpose of overcoming this difficulty that lines of shafting are now made smaller than formerly and run at higher speeds, thus reducing the weight of shafting and pulleys, and consequently the friction.

But there is a cause of waste of power by transmitting lines, which, though looked after sharply in many shops, is sadly neglected in many others, and that is the fact that not enough attention is given to securing and maintaining perfect alignment. There are many shops where this evil exists and where its removal would not only result in a very considerable saving of fuel, but save much wear and tear upon the line and its boxes. Such conditions are very apt to be found in lines of shafting which are supported by the framing of roofs, or by floor timbers, which may have been heavily loaded after the lining of the shaft. Instances have been met with, where a bearing for a 2½″ shaft was over an inch lower than the bearings on each side of it, and 10 feet distant. The force required to bend such a shaft to that extent might be expected to cause considerable friction; and that it did do so was proven by the fact that the bearing gave a good deal of trouble by heating, which was entirely removed when it was placed in its proper position.

The common method of lining shafting, by stretching a line by which to make the lateral adjustment, and using the ordinary carpenter's level for the vertical adjustment, seems to give satisfaction in many shops, but where a considerable degree of accuracy is desired it is too crude; especially the leveling operation, which will usually prove to be surprisingly inaccurate when subjected to a thorough test.

There is little doubt but that the best way to secure good alignment of shafting is by the use of the engineer's transit and wye level, and the most accurate work of which such instruments are capable is not misplaced in such operations. When properly equipped for it this is not only the best and most accurate way of doing such work, but is also the quickest way.

I present with this, drawings of an apparatus devised for this purpose by Mr. Chas. A. Bauer, which seems to be and in fact has proven in use to be all that could be desired in this line.

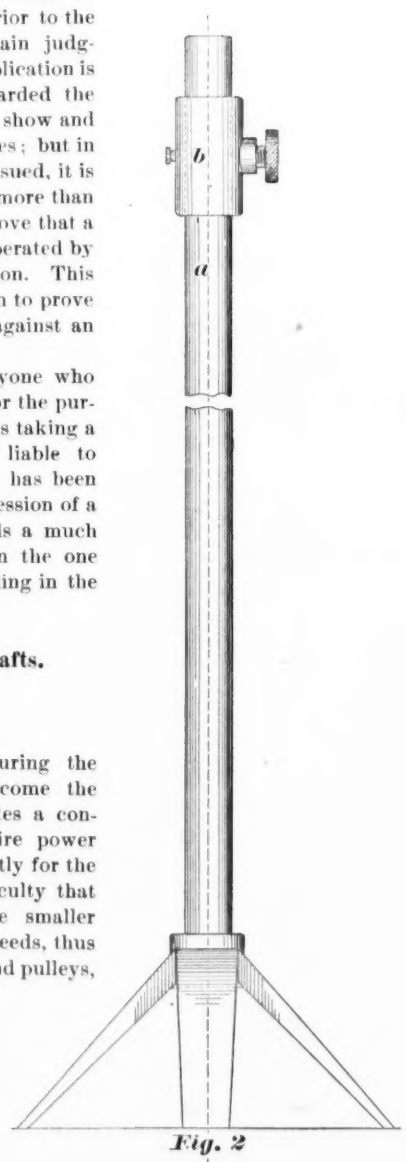


Fig. 2

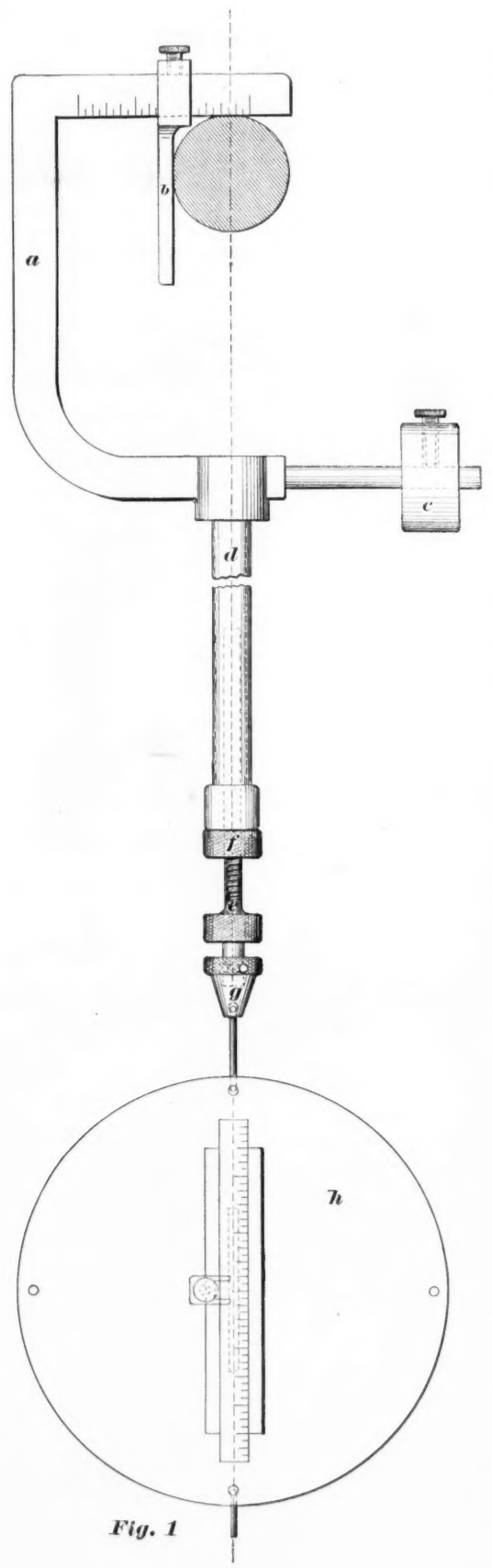


Fig. 1

Referring to Fig. 1, *a* is a forged hook, the lower straight edge of which rests upon the top of the shaft as shown. Along this edge graduations are placed, the use of which will hereafter be explained; *b* is a sliding jaw fitted nicely to *a*, its edge next to the shaft being straight and so fitted as always to be at right angles to the graduated edge of *a*. The zero line of these graduations is so placed that when the sliding jaw *b* is brought fair with it, its edge which comes in contact with the shaft will lie in the center line of the apparatus; *c* is an adjustable weight, which serves to balance the device and make it hang perpendicularly. This, however, need not be changed after being once properly adjusted. Screwed into the lower portion of *a* is the piece of gas pipe *d*, which may be of any desired length, and should be provided with a thimble, so that pieces of pipe of various lengths may be screwed into it, to provide for use upon lines of shafting at different heights from the floor, upon which the instrument must stand. Upon the lower extremity of this pipe is screwed a cap, which is drilled and tapped to receive the threaded shank of the stud *e*, this stud being provided with the knurled check nut *f*. At the lower extremity of this stud is fitted the piece *g*, having a knurled collar, and being free to turn upon the stud. It is kept in place by a small pin, passing into a groove turned in the stud; and into it is hooked the short wire link to which is attached the target *h*. This target consists of a thin cast-iron plate, about 8″ in diameter, and having a narrow rectangular opening, covered by one of the new thin steel scales, which was chosen on account of its lightness. It is fitted into a recess provided upon the face of the target, in such a way that it may be moved endwise to any desired position, and held there by the small clamp and milled screw, as shown. Through the center of this scale is a hole, about .01″ in diameter. Around the edge of the target plate are drilled four holes, equi-distant from each other, used to attach the target to the hook, and to the target a plumb-bob, which serves to keep the whole arrangement steady.

The hole which is drilled through the steel rule is the sighting point to which the telescope is directed, and in most places will be clearly visible through a good telescope; but for long lines of shafting, or in places where there is not sufficient light to make this point clearly visible, it is illuminated by a lamp placed upon the stand, Fig. 2. This stand is constructed by screwing a piece of gas pipe, somewhat longer than the height of the instrument, into a three-legged base, as shown. On to the sliding piece *b* is hung a lamp, so adjusted that its light shines through the hole in the scale. This makes a point of light which is easily seen in any place, and at any distance at which the device is likely to be used.

In most lines of shafting there is some bearing which it is not desirable to move, either on account of the location of gearing near it, or it may be located in a wall, or some place where it is unlikely to have moved from its original position. Commencing at this point, the size of the shaft is to be ascertained, and the sliding jaw *b* set at a distance from the zero line equal to one half the diameter of the shaft; and for this purpose it is most convenient to so number the graduations as to impart to them values just twice their actual magnitude.

The hook is now placed over the shaft, and the sliding jaw being brought into contact with it, it is evident that the zero line will be vertically over the center of the shaft.

The steel scale *i* is now to be clamped in its central position, and the height of the target adjusted by means of the threaded shank of *e*, so that the hole in the scale comes level with the instrument. Now, the instrument being kept accurately level, the apparatus is moved from one bearing to the other, and the shaft raised or lowered, until all are at the same height, and consequently straight. If the shaft is of varying diameters, compensation is made for it by moving the sliding jaw, in or out, a distance equal to half the difference in diameter; and the scale *i* is moved vertically the same distance. By this means it is apparent that the sighting point is kept always at the same distance from the center of the shaft, and vertically under it.

For the lining of the shaft sideways, the hook is dispensed with, and the target suspended from one side of the shaft by a fine copper wire, the other pair of holes being used so as to bring the scale into a horizontal instead of a vertical position. Allowance is then made for varying sizes of shaft, by adjusting the scale as before. It now becomes apparent why the scale *i* must be quite light; if it were not so, changing its position from time to time, to suit different sizes of shafting, would cause the target to deviate from its correct position.

It is believed that anyone who has a taste for doing things in the best possible manner will hardly be satisfied to line shafting in any other way, after having tried this.

Seth Braggins, formerly connected with the Shipman Engine Manufacturing Company, of Rochester, N. Y., has severed his connection with that company and accepted the superintendency of the Acme engine department of the Rochester Machine Tool Works.

The *Masonic Record* suggests that one of the long felt wants is a machine for raking and baling hay as cut in the swath.

Some of the famous London omnibuses are lighted by electric lamps.

Massachusetts mill owners are protesting against the law which requires that children employed in mills shall know how to read.

There is no objection to protesting, but the law ought to be enforced. It is a good one, and these protesting mill owners put themselves in a very small hole in protesting against it.

It has been established by a number of tests that have been made in France, where electrical machines have been employed in various industries, that currents are not dangerous to life until a power of 500 volts is reached. All a person has to do, therefore, to insure himself against harm from an electric wire is to keep an eye on the volts. The volts are the——. Well, the volts are harmless in small numbers; but beware of a crowd.—*Buffalo Commercial Advertiser.*

Improved Machine Tools.

We present on this page engravings of two machine tools made by P. Blaisdell & Co., Worcester, Mass.

The drill shown has the quick return movement which originated with the senior member of the firm; other features of construction can be seen in the engraving.

The lathe shown is 16 inch swing. The cones are made for 2½ inch belt, which gives strong driving. The spindles are made of crucible steel. The front bearing of head spindle is 2¼ inches diameter and 4¼ inches long; the tail spindle is 1¾ inches diameter.

The two inside Vs are 8½ inches apart from center to center, making a triangle with the center of spindle. The rod feed and lead screw are on the front side, and well protected from dust. Either iron or gun metal boxes are used, as may be desired. Every lathe is tested as to truth of the work it will do before leaving the works.

Babbitt Metal.

The composition of babbitt metal is a question about which there seems to be much confusion and diversity of practice; and the mechanic who undertakes to find out from the makers and users of the alloy, just what it is composed of and in what proportion, will probably receive many and diverse answers.

Many shops make their own babbitt, each one by a formula differing from most all the others; and in this way different specimens may be met with, varying from a mixture of eight parts of lead to one of antimony at one extreme, to one containing no lead and considerable copper and tin at the other. Even the manufacturers and dealers will offer for sale "babbitt metal" in bars at prices ranging from 10 to 75 cents per pound; and they will insist that it is all "babbitt metal," only different qualities.

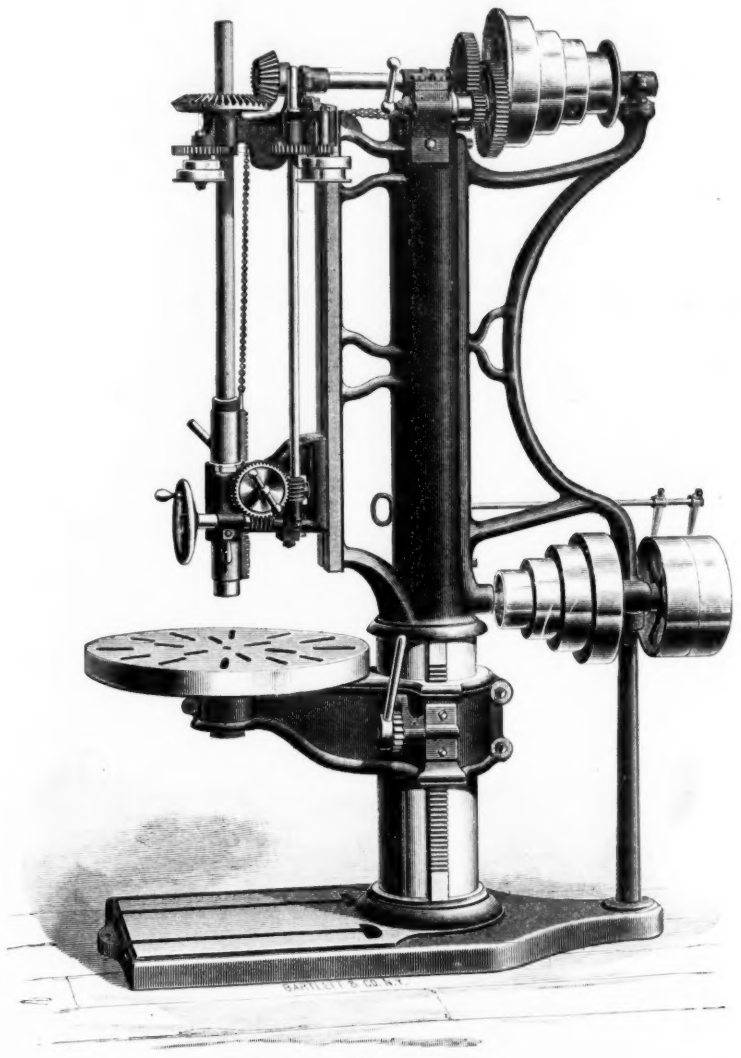
Now, if any one wishes to use as a lining for boxes an alloy which can be sold as low as 10 cents per pound, of course he should be granted the privilege, but when he calls the stuff babbitt metal he deceives himself—or some one else.

We often hear the expression good babbitt, poor babbitt; but there is really but one babbitt metal, and if any alloy is either much better or much worse than that, it is not babbitt, but something else. Different authorities give various formulas for the composition of the metal, but the following is considered to be the standard babbitt metal.

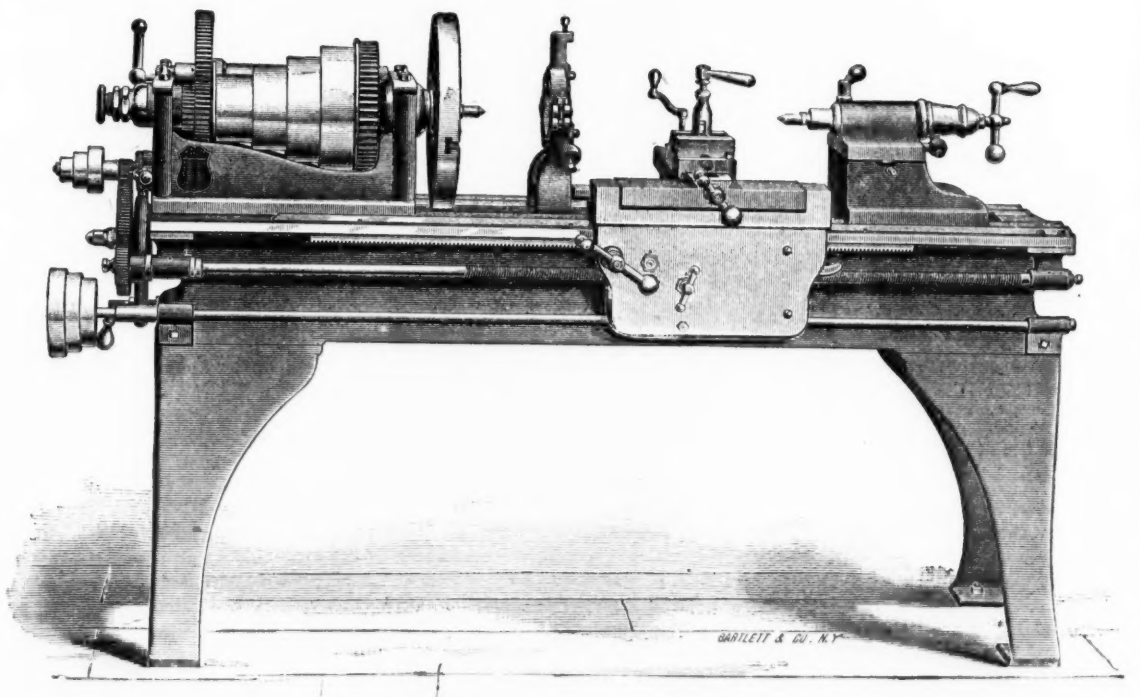
Melt separately 4 parts copper, 12 Banca tin, 8 regulus of antimony. After fusion add 12 parts tin. The antimony should be mixed with the first portion of the tin, and the copper added after taking the melting pot from the fire. The surface of the charge should be protected from oxidation by a covering of powdered charcoal.

This mixture constitutes the "hardening," and the babbitt metal is made by fusing 1 part of this hardening, with 2 parts of tin, thus making the metal consist of 3.7 parts copper, 7.4 parts antimony, and 88.9 parts tin.

It is said that efforts to raise silk in Texas are proving very successful.



Improved Upright Drill.



Improved Engine Lathe.

Air Compressor Attachment for Locomotives.

Thomas P. Sweeney, of Sacramento, Cal., has devised an air compressor attachment for locomotives, in which the main cylinders can be used whenever it is desirable for compressing air to operate the brakes, or for any other desired purpose.

It consists of a pipe connecting the steam chest or cylinder with the air reservoir, and suitable cocks, by which communication may be made and cut off at will, together with check and safety valve and operating rod.

This invention is of especial value upon roads where there are heavy grades, as the operation is so much quicker than the ordinary air pump that at a speed of twenty miles per hour, with a four-foot eight-inch wheel, and eighten by twenty-four inch cylinder, it will charge the train one hundred times quicker than the ordinary air pump. It is easily applied to any engine, and is at command at all times; and being easily and quickly put in operation, the danger of accident is much less than with the ordinary air pump. Its cost per engine is scarcely of consequence. It needs no repairs, and saves running the air pump at a high rate of speed, which has to be done on down grades with heavy trains, when that is the only supply. Then, when the air pressure becomes low, a train can be charged with this apparatus in a few seconds, and the air pump may be run at a moderate rate of speed, which saves repairs and the liability of the pump packing burning out. There is an assurance of a supply of compressed air on any train, the engine coupled thereto being equipped with this apparatus.

Its operation is as follows: When it is necessary to force air back to the air brakes under a train of cars which are coupled to the engine, the steam being shut off from cylinders, a valve, which is under control of the engineer, is opened, and the valve gear of the engine being reversed to a point slightly back of half stroke, the piston of the main cylinders will draw air into cylinders through the exhaust pipes (which can be connected with the exterior air, if desired), and will force it through the steam chest into the air drum or reservoir, until any desired pressure has been produced; and from the air reservoir the air is conducted through the ordinary pipes beneath the train, so as to operate the brakes as occasion may require.

This device may be used at any time when the train is under sufficient headway, and from the size of the cylinders it will pump air to a high pressure in a very few strokes.

This device has been in use on several divisions of the Southern Pacific Company during the past eighteen months, and has, we are informed, never once failed to do what was expected of it.

Deputies of the N. A. S. E.

Following are the names of the State and traveling deputies so far appointed by President Barker, of the National Association of Stationary Engineers: State Deputies: New Hampshire, C. H. Austin; Massachusetts, F. D. Wheeler; Rhode Island, Chas. A. Potter; Connecticut, Frank A. Foster; New York (Northern), Van Guy Sling; (City and County), R. O. Smith; (Southern), ——— Hoffman; New Jersey and Eastern Pennsylvania, H. D. Cozens; Western Pennsylvania, ——— Hoffman; Maryland, Wm. H. Jones; Ohio (Southern), John Kearney; (Northern), D. W. McClelland; Indiana, John Kalph; Illinois, J. G. Beckerleg; Wisconsin, John Griffiths; Arkansas, P. W. J. Whitnell; Missouri (Eastern), E. P. Amblet; (Western),——— Munnerest; (Central) Goldeve; Minnesota, John B. Moore; Nebraska, J. Bailey; Colorado, C. R. Elliott; Michigan, John Trix; Iowa, J. Berkshire; Kentucky, W. H. Kemper; Tennessee, J. P. Sneaden; Georgia, J. P. Warren.

Traveling Deputies: J. E. Pratt, W. H. Gibson, J. H. McMann, Harry Knowlton, Frank Scholl, Oscar Greenhalge, W. A. Dinsmore, Wm. Lang, Ch. Schlotterbeck, Fred Brandt.

In *Practical Mechanics*, W. D. Forbes, criticising the modern lathe, says, among other things:

"Now that the patent on the taper attachment has run out, there is no reason why the tail-stock should have a set-over. Good results cannot be hoped for by its use, while perfect work can be had from the taper attachment; to put it on a lathe would add but little to its cost, when the cost of the set-over is deducted."

The taper attachment for lathes is all right, and a necessity, in the best of modern machine shop practice, and especially so in the tool room; but that its presence upon a lathe does away with the necessity for the tail-stock set-over is an idea which we think will scarcely be accepted by the men who handle lathes; and that "good results cannot be hoped for by its use," is a statement which is flatly contradicted by the good results which have been obtained by its use for years; not in turning taper work, of course, but in preventing lathes from turning taper work. If a practical lathesman should be put on to a lathe built without set-over, and the lathe should get to turning a little small up "next the dog" as it surely would some time, then the remarks of that lathesman upon the subject, might be quite interesting and instructive, to those who think the set-over is useless, and would be quite likely to give them some new ideas upon the subject.

Foundry Flasks or Boxes.

By S. Bolland.

Flasks or moulding boxes in which the patterns are rammed are made with the view of confining the amount of sand to be used to its smallest limit, consistent with safety, and should be made of such dimensions as will allow of the rammer being used at the distance of from 2″ to 3″ from the pattern. If made of wood there must be a sufficient body of sand between the casting and flask to prevent damage from burning. On this account iron flasks (as a rule) can be made much smaller, thereby saving time and labor in filling in.

Fig. 75 shows a 14″ iron flask for small work, and where a large quantity of machinery small work is made such flasks are much superior to wooden ones. Having no bars top or bottom, they are readily rammed and closed, two clamps being sufficient to bind them together for casting.

But when there comes a job requiring large numbers of extra light castings, the sand can be rammed in a snap flask, in the same manner as in the iron one, and when the mould is closed the flask can be loosened off and the sand cope held down by a flat weight heavy enough to resist the pressure when cast, a hole being cast in the weight to expose the runner or gate. Such a flask is shown at Fig. 76. The hinges and latches are seen at opposite corners, the other corners being bolted or screwed fast. The great advantage in this kind of flask (where it can be used with safety) is the number of iron or wood flasks it saves, as well as the rapidity with which it can be worked.

Fig. 77 is a perspective view of a 24″ flask. As will be seen, this method does away with the necessity for either clamps, boards or plates, the bottom or drag part, as seen at Fig. 78, having flat bars cast on. The intermediate parts or cheeks can be made of any depth required. The pin holes being bored to templet insures a fit, no matter which parts are used. The flask shown has cheek 12″ deep; others can be made of different depths, enabling the moulder to rig up a part flask to suit his job in very short order, nothing being required but the pins and keys, which must be kept in order by some responsible man who will see that they are taken out and stored when not in use. Internal flanges may be cast on the bottom edge of the cheeks to suit the kind of work they may be used for. For general jobbing purposes this method of making flasks is good, for though a little expensive at first, they pay well in the end.

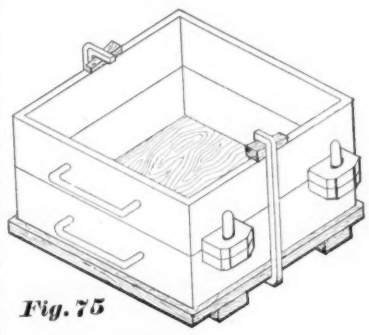


Fig. 75

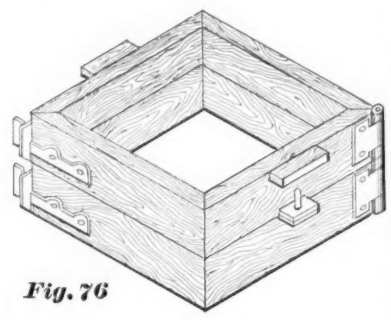


Fig. 76

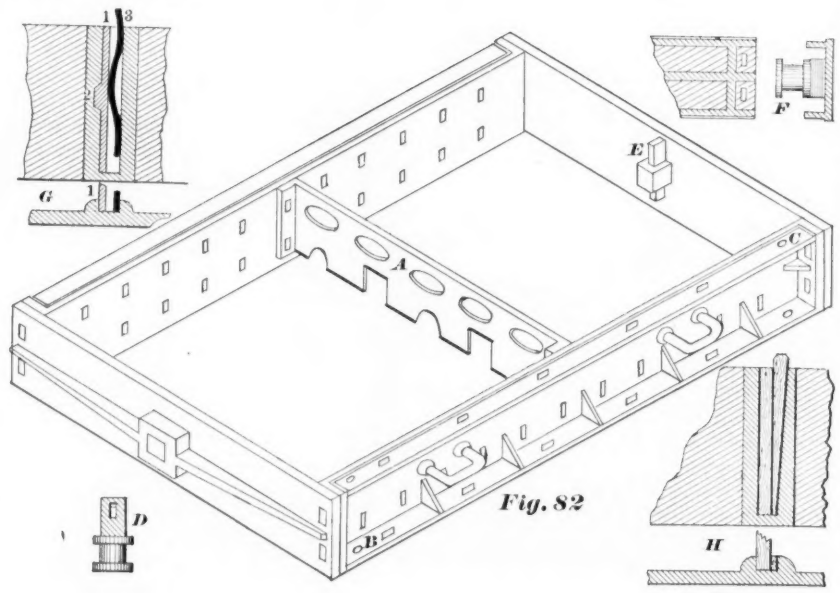


Fig. 82

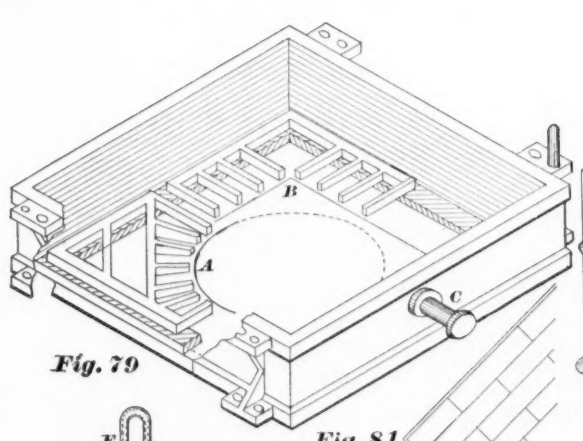


Fig. 79

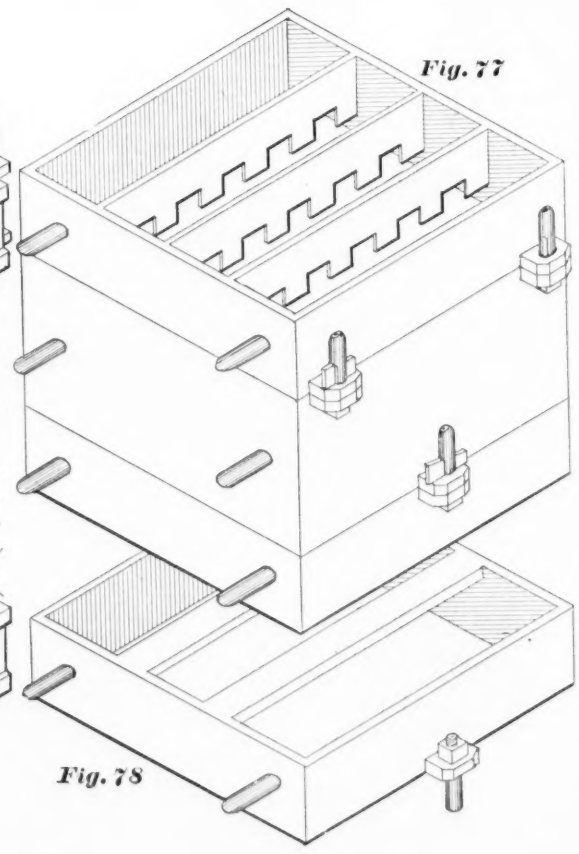


Fig. 77

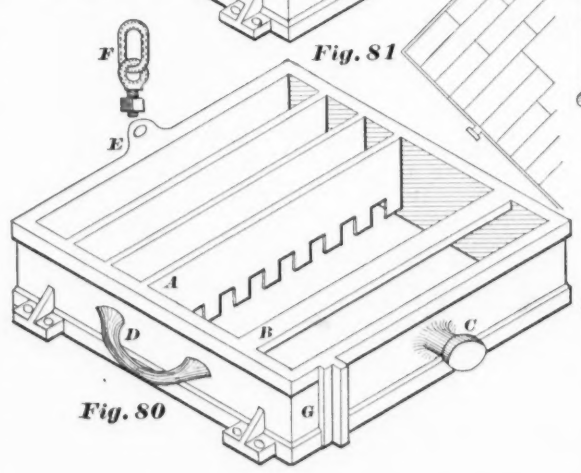


Fig. 80

Fig. 81

Fig. 78

Larger Flasks, Copes, Etc.

At Fig. 79 a four feet cheek part 12″ deep is shown, with internal flange to carry grates, which may be made to fit any form of pattern, as shown at *A* and *B*, the grate in the former fitting a circle, the latter being square, such as would be required for tanks, etc. The lugs are strong and the bolt holes are cast in, but the holes for pins must be drilled to templet, so that any cheek may be used for cope or drag. The half inch strips cast on the edges give strength sufficient for this sized flask, and are more easily made than flanges. The lugs must be rammed in a core and bedded against the pattern, and care must be taken to have the holes for bolts made right and left. The internal flange adds strength to the flask, and enables the moulder to rig up for any kind of job at no greater expense than a few grates.

At Fig. 80 I have shown the way to make the cope and drag; the notches in the bars will be appreciated by jobbing moulders particularly. *A* shows bar for cope, and *B* for drag. Where it is practicable, wrought-iron swivels can be cast in, as shown at *C*, Fig. 79; but if swivels must be cast-iron, let them be strong, as shown at *C*, Fig. 80.

It would be preposterous for me to lay down rules for lifting and handling flasks which would be applicable to all shops, but I show at Fig. 80 two other methods for lifting purposes, besides the swivels. The one at *D* is a cast handle made in a core, and set against the pattern when the flask is made; of course, wrought-iron may be substituted, which is better. At *E* is shown a plain lug, into which, when needed, the ring bolt *F* can be made fast. The latter is very simple, and can be made of universal application. Fig. 81 gives plan of a plain cope for floor uses (without flange top or bottom), 8 feet square; it has 15″ square hole in center. This flask must be 9″ deep and 1″ thick on the outside and $\frac{7}{8}$″ in the bars. Staking pieces can be cast on, as shown at *G*, Fig. 80. Let the cross on tie bars be placed as seen. The reason for sides and bars being so near alike in thickness is that the expansion and contraction whilst the box is in use may be kept as near alike as possible all over. The arrangement of cross bars is intended to counteract in some measure the inequalities of the thrust, giving, as they do, elasticity to the structure. A box of this kind, cast with good strong iron, will outlast any other kind that is made for floor purposes. When the sides are made heavy, with flanges, etc., cast to their bars, you may look out for a broken box before it has been in use very long.

Flasks Made Up of Loose Sides, Ends and Bars.

Fig. 82 is a view of sides, ends and bar for a flask 5 feet wide by 8 feet long and 12 inches deep. As in this case all the parts may be cast in open sand, a very large flask may be strongly made at a light expense comparatively. It will, of course, be readily seen that (if boxes must be made to fit the job and save labor in moulding) unless some other plan be adopted than to make them all in one piece, the foundry would soon be full of unwieldy flasks costing considerable time and money to make. It is to overcome this difficulty that the method shown at Fig. 82 is brought into use. It will be seen at *A* that the bars can be cast to fit any form of pattern; the sides can be made to bolt together as cope and nowel, holes for pins being drilled as shown at *B* and *C*; the flanges can be bracketed to any required degree of strength. Let the flanges stand in from the edge of side $\frac{1}{4}$″ so as to leave a space of $\frac{1}{2}$″ when they come together, into which mud can be pressed to prevent running out. The end shown is for a wrought swivel *D*, which is secured by a key as seen at *E*. Should the box be very wide, and require to be turned over on the swivels, the ends can be still further stiffened, as shown at *F*. At *G* I have shown another method which saves bolting of all the bars; this method necessitates the casting of pockets on the sides to receive the end of a plain bar, as shown at 1. These pockets are made wide enough to admit of the projection 2 sliding in easily; when the bar rests on the bottom this projecting piece is opposite the recess cast in the pocket to receive it, and is driven home by the bent iron 3. This iron or wedge is a plain piece of wrought-iron $1\frac{1}{4}$″ wide by $\frac{1}{4}$″ thick, bent as seen, and driven down so that the bar is pressed close into the groove; by leaving this wedge standing $\frac{3}{4}$″ out at the top it can be quickly knocked out and the bar loosened instantly. This is a very quick method, and only requires a long bolt here and there along the length to make it equally as safe as the other. Another advantage where pockets are cast to receive the bars is shown at *H*, as on a pinch wooden bars may be substituted for iron ones and made fast with wooden wedges.

Flasks Made of Wood.

Where wooden flasks can be profitably used good white pine should be chosen to make them of, as it outlasts any other kind and keeps its shape best. Ordinarily they may be made up to 3 feet square out of 2″ lumber; beyond that size and up to 6 feet it is best to use 3″. Many firms go to great expense in dovetailing the joints, a very bad method too, as the vent blazes out at the joints of the dovetail, and the flask is rendered useless in a very short time; a much better plan is to let the ends into the sides about $\frac{1}{2}$″ and nail them firmly together, after which a $\frac{1}{2}$″ bolt can be passed through each end in the inside; if the flasks be long additional bolts may be passed through in the middle. Greater dependence can be placed on the bolts than on any system of dovetail or spikes.

I have seen many plans for preserving the joints of wooden flasks (which, if unprotected, soon burn away) and in most cases the supposed cure has proved worse than the disease; but should it be considered worth while to protect the edge, (and I am satisfied that it is, where the flasks are in constant use), have strips of cast-iron made $\frac{1}{4}$″ thick and the width of the lumber, with pins cast on. Have these strips drilled with countersunk holes for screw-heads, and set them hard down on a coat of thick metallic paint. This makes the joint between the iron and wood perfectly air-tight, preventing the gas from escaping, and consequently the flask is saved from burning. I have rigged flasks this way which have been in use every day for months with-

out taking any harm from the blaze at the joint.

Another thing I would suggest, where wooden flasks are in constant use: have a boy, or two, if need be, to throw water around the flasks as they are poured; it pays in the end to do this. Sometimes, in shops where help is scarce and the crane untrustworthy, it is out of the question to make large iron flasks. In such cases let cast-iron ends be made with good bolting surface for the wood to bind against; have also here and there a cast bar to which the side must be firmly bolted. These precautions add very little to the weight, but serve to increase the strength and usefulness of the flask. Swivels or handles cast on plates can be bolted on the sides or ends, making them in every respect almost equal to the best iron flask.

A New Mathematical Instrument.

A new mathematical instrument has been brought out by J. F. Bennett & Co., of Sheffield. It is called the "Marvel," and from the description given in the *Ironmonger* the work which can be done with it is something of a marvel.

It is a compass, the stationary leg of which is graduated along its length. Upon this leg may be clamped "templets" of any desired figure, which, as the compass is swung around, cause the other leg to approach or recede from the center, and thus the figure drawn takes the shape of the templet. The movable leg does not bear directly upon the templet, but has attached to it by a clamp screw, a graduated arc, by means of which a small bar, suspended at the main joint of the instrument, is set at any desired distance from the movable leg, and this bar comes in contact with the templet. Different sized figures can be drawn from the same templet by changing the position of the templet upon the stationary leg.

Ellipses of any desired proportions, pentagons, hexagons, decagons, or any required figure can be reproduced rapidly and accurately.

Fox Turret Lathe.

The engraving shows a Fox turret lathe, made by the Gage machine works, Waterford, N. Y.

The lathe is of 15″ swing, 5 foot bed, and in addition to the well-known features of the Fox lathe, it has the advantages of the turret, which has six steel bushed holes for holding tools of various kinds. By the use of this turret several additional operations may be performed upon a piece of work at a single chucking, and the work greatly facilitated.

The spindle is of hammered steel and runs in hard bronze boxes. The shafts for the chasing apparatus are also of steel, the screw being covered to protect it from dirt and chips. The turret may be moved to and from the work either by a screw or rack and pinion, all of forged steel, and by means of a swivel attachment the line of this motion may be made to take any desired angle with the bed for taper work. The turret also has a set-over or motion at right angles with the bed.

Each lathe is furnished with a shelf attached at the back by brackets, six chucks, or tool holders for turret, taper attachment, and one hob and leader, which is made to cut 11½ threads to the inch unless otherwise ordered.

This lathe seems well adapted for a large class of work on which it is desirable or advantageous to perform a multiplicity of operations upon a single piece.

Practical Drawing.

By J. G. A. Meyer.

THIRTY-FIFTH PAPER.

Problem 44.

348. To find the dimensions of the base of a truncated prism *D*, which meets another given prism *C* in straight lines in any given plane—all the lateral edges of the two prisms to be parallel to the vertical plane of projection—also to find the length of the long lateral edges of the prism *D* when the length of the short lateral edges of the prism *D* are known.

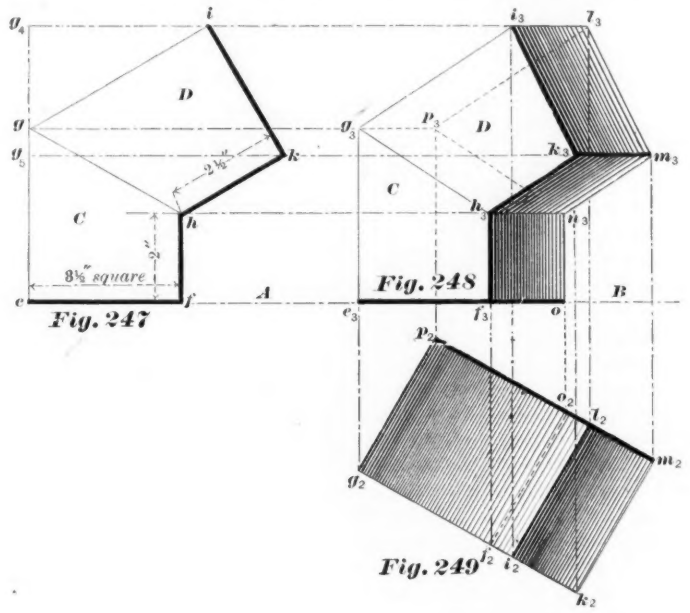


Fig. 247. Fig. 248.

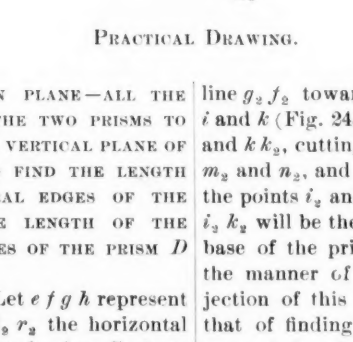


Fig. 249.

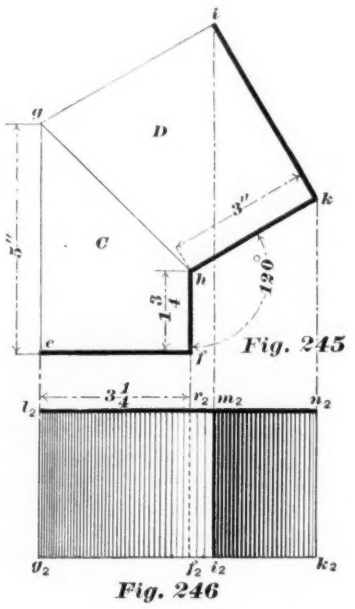


Fig. 245.

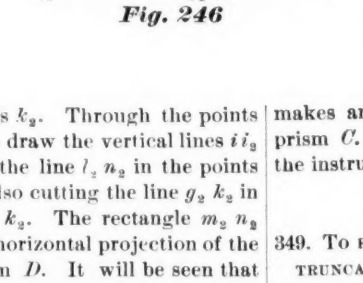


Fig. 246.

Practical Drawing.

Figs. 245 and 246. Let *e f g h* represent the vertical, and $g_2 f_2 l_2 r_2$ the horizontal projection of the truncated prism *C* whose dimensions are given, and the line *g h* the vertical trace of a plane containing the lines in which the lateral faces of the two prisms *C* and *D* meet; it is required to find the length and breadth of the base of the prism *D* whose lateral edges are parallel to the vertical plane of projection, and also to find the length of the lateral edges represented by the line *g i*, when the length of the short lateral edges of the same prism is equal to three inches; the edges *f h* and *h k* must form an angle of 120 degrees.

Through the point *h*, Fig. 245, that is the upper extremity of the line *f h*, draw a straight line *h k*, making an angle of 120 degrees with the line *f h*. From *h* on the line *h k* lay off a point *k*, the distance between the points *h* and *k* must be equal to three inches, which is the given length of the short lateral edges of the prism *D*. Through the point *g* draw a line *g i* parallel to *h k*; through the point *k* draw a line *i k* perpendicular to the line *h k*, cutting the line *g i* in the point *i* and thus completing the vertical projection *g i h k* of the prism *D*.

Our next step will be to find the horizontal projection of the prism *D*. Prolong the line $l_2 r_2$, Fig. 246, towards n_2, and the line $g_2 f_2$ towards k_2. Through the points *i* and *k* (Fig. 245) draw the vertical lines $i i_2$ and $k k_2$, cutting the line $l_2 n_2$ in the points m_2 and n_2, and also cutting the line $g_2 k_2$ in the points i_2 and k_2. The rectangle $m_2 n_2 i_2 k_2$ will be the horizontal projection of the base of the prism *D*. It will be seen that the manner of finding the horizontal projection of this base is precisely similar to that of finding the horizontal projection $m_2 n_2 i_2 k_2$ of the base in Fig. 244. The rectangle $l_2 m_2 g_2 i_2$ in Fig. 246 is the horizontal projection of the longest lateral face or side of the prism *D*; in fact, this rectangle and the rectangle $m_2 n_2 i_2 k_2$ make up the horizontal projection of the prism *D*.

All the lines in Fig. 245 are parallel to the vertical plane of projection; consequently, according to Art. 242, we see in this projection the correct length of each line, and therefore the length of these lines can be obtained by measurement. Hence the length of the long lateral edges of the prism *D* will be equal to length of the line *g i*; the length of the base of the same prism will be equal to the length of the line *i k*. For the correct breadth of the base we must look in Fig. 246; in this projection, as we have already stated, the base is represented by the rectangle $i_2 k_2 m_2 n_2$, and since the sides $i_2 m_2$ and $k_2 n_2$ of this rectangle represent the edges whose length we wish to obtain, and since these lines are parallel to one of the planes of projection, that is, the horizontal plane of projection, it follows that the length of the lines $i_2 m_2$ or $k_2 n_2$ must be the correct breadth of the base of the prism *D*.

It will also be noticed that when the line *g h* is produced it will not bisect the angle formed by the lines *f h* and *h k*; in fact, the line *g h* produced cannot bisect the angle *f h k* unless the plane whose vertical trace coincides with the line *g h* is placed in a position which will make the bases of the two prisms equal.

From the foregoing we learn that when the plane containing the lines in which the faces of the prisms meet each other does not bisect the angle *f h k* or the angle *e g i*, the base of one prism will be longer than the base of the other.

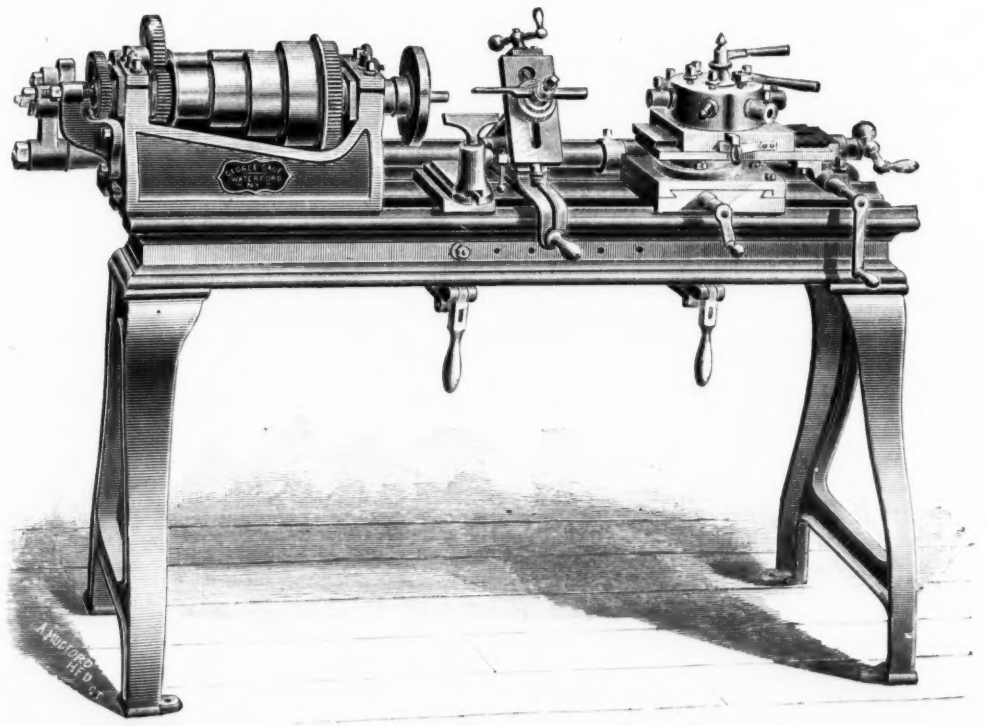
Directions.—In the space marked Prob. 44 draw the vertical and horizontal projections of the truncated prism *C* having the same dimensions as those given in the illustration. Assume this to be the given prism, then find the dimensions of the base and the length of the long lateral edges of the prism *D*, which makes an angle of 120 degrees with the prism *C*. Use a 3 inch scale and follow the instructions given in this problem.

Problem 45.

349. To find the projections of two given truncated prisms whose lateral faces are not parallel to either plane of projection, and the lateral edges of only one prism parallel to the vertical plane of projection.

In this problem it is required to find the vertical and horizontal projections (whose outlines will be similar to those shown in Figs. 248 and 249) of two given truncated prisms whose dimensions and the angles which their lateral edges shall form with each other are given in Fig. 247. The faces or sides of the prisms represented by the lines $p_2 m_2$ and $g_2 k_2$ are to make an angle of 30 degrees with the vertical plane of projection.

In problems of this kind we make first a drawing of the prisms as shown in Fig 247, in which all the lateral edges of the two prisms are parallel to the vertical plane of projections, so that we can see their true lengths. Then, around any straight line which is parallel to the vertical plane of projection, we assume these prisms to be revolved (in a manner similar to that of swinging a door on its hinges) until the faces of the prism make the required angle with the vertical plane of projection. Now by indicating and following the paths of the several points or extremities of lines, the projections of the points and edges of the prisms can be easily determined. Consequently first draw the elevation or vertical projection of the prisms whose lateral edges are parallel to the vertical plane of projection, and thus obtaining an outline as shown in Fig. 247. In making this projection follow the method and instruction given in Problem 43. By so doing we will obtain the true lengths of all the edges which are parallel to the vertical plane of projection. Now assume the prisms to be turned around the edge which is repre-



Fox Turret Lathe.

sented by the line $g\ e$, so that the sides or faces which are represented by the lines $p_2\ m_2$ and $g_2\ k_2$ in the horizontal projection, will form the given angle of 30 degrees with the vertical plane of projection; then while the prisms are in this position find their horizontal and vertical projections in the following manner:

Fig. 249. Below the ground line $A\ B$, and at any convenient distance, draw a line $p_2\ m_2$ which will form an angle of 30 degrees with the ground line $A\ B$. On the line $p_2\ m_2$, mark off two points p_2 and o_2, the distance between these points must be equal to the length of one of the sides of the base of the prism, namely $3\frac{1}{2}$ inches; through the points p_2 and o_2 draw the lines $p_2\ g_2$ and $o_2\ f_2$ perpendicular to the line $p_2\ m_2$, make the length of the line $p_2\ g_2$ and also that of the line $o_2\ f_2$ equal to $3\frac{1}{2}$ inches, thus obtaining the extremities of the lines or the points g_2 and f_2; through these points draw the line $g_2\ k_2$ and produce it towards k_2. The square $p_2\ o_2\ g_2\ f_2$ will be the horizontal projection of the prism C; it now remains to make the horizontal projection of the prism D.

The prism D occupies an oblique position, and therefore all its lateral edges in the horizontal projection must be shown foreshortened, and the amount that these edges must be foreshortened we obtain from Fig. 247, thus:

Prolong the line $g\ e$ towards g_4, and assume that the prisms are to be turned around the line $e\ g_4$. In turning the prisms around this line, the horizontal distance between the line $e\ g_4$ and the point i will not be changed, neither will the distance between the line $e\ g_4$ and the point k be changed. Through the point i draw the horizontal line $i\ g_4$, cutting the line $e\ g_4$ in the point g_4, also through the point k draw a line $k\ g_5$ cutting the line $e\ g_4$ in the point g_5.

Now see Fig. 249. On the line $g_2\ k_2$ lay off from the extremity g_2 a point i_2; the distance between the points g_2 and i_2 must be equal to the length of the horizontal line $g_4\ i$ in Fig. 247. The best way to do this will be to set the points of the plain dividers (which are shown in Figs. 62 and 63) to the length of the line $g_4\ i$, and then transfer this length to the line $g_2\ k_2$ in Fig. 249. In a similar manner lay off on the line $g_2\ k_2$ from its extremity g_2 a point k_2; the distance between these points must be equal to the length of the horizontal line $k\ g_5$. Through the points i_2 and k_2 draw the lines $i_2\ l_2$ and $k_2\ m_2$ perpendicular to the line $g_2\ k_2$, cutting the line $p_2\ m_2$ in the points l_2 and m_2, which will complete the horizontal projection of the prism C and D.

In this projection the rectangle $g_2\ i_2\ p_2\ l_2$ is that face or side of the prism D which will be represented by the parallelogram $g_3\ i_3\ p_3\ l_3$ in Fig. 248; the rectangle $i_2\ l_2\ m_2\ k_2$ represents the base of the same prism, and the rectangle $f_2\ o_2\ m_2\ k_2$ is that face which will be represented by the parallelogram $h_3\ k_3\ m_3\ n_3$ in Fig. 248.

In turning the prisms around the line $e\ g_4$ the height above the ground line $A\ B$ of the points g, h, i, k, shown in Fig. 247, will not be changed; therefore to find the vertical projection of the prism D we continue as follows:

Through the points g, h, i, k draw the horizontal lines $g\ p_3$, $h\ n_3$, $i\ l_3$ and $k\ m_3$. If now the solutions of the previous problems have been mastered, then the reader will readily understand and perceive that the extremities of the lines which make up the outline of the prism D in Fig. 248 must lie in the horizontal lines drawn through the points g, h, i, k, and consequently the heights above the ground line $A\ B$, or in other words, the vertical distances between the extremities of the edges, are known. But we have already made the horizontal projection of the prism D, consequently the horizontal distances between the extremities of the lines which represent the same edges of the prism are also established, and therefore the extremities of these lines in the vertical projection must lie in vertical lines drawn through the corresponding extremities in the horizontal projection. Lastly, since each one of the extremities must lie in a horizontal and also in a vertical line, it follows that vertical projection of the extremities of the lines in Fig. 248 are the points in which the horizontal and vertical lines drawn through the corresponding points shown in Figs. 247 and 249 intersect each other. Take, for instance, the point i in Fig. 247; this same point is represented in Fig. 249 by the point i_2, and according to the foregoing remarks, the vertical projection of this point is the point i_3 in which the horizontal line drawn through the point i intersects the vertical line drawn through the point i_2. But when we have obtained the vertical projections of the extremities of lines, the vertical projection of these lines are also known, because the lines which join the projected points are the vertical projections sought for.

Hence, to continue the construction, draw through point g_2 the vertical line $g_2\ g_3$, cutting the horizontal line $g\ p_3$ in the point g_3; this point will be the vertical projection of the extremity whose horizontal projection is the point g_2. Through the point p_2 draw a vertical line, $p_2\ p_3$, cutting the horizontal line $g\ p_3$ in the point p_3; this point will be the vertical projection of the extremity which is represented by point p_2 in Fig. 249; and the line joining the points g_3 and p_3, in Fig 248, will be the vertical projection of the line whose horizontal projection is the line $g_2\ p_2$. The point i_3, as we have already seen, is obtained by finding the point in which the horizontal line $i\ i_3$, and the vertical line $i_2\ i_3$, cut each other. Joining the points g_3 and i_3, we obtain the vertical projection of the line whose horizontal projection is the line $g_2\ i_2$. In a similar manner, plainly shown in the illustrations, we find the vertical projections of the remaining extremities of the lines which make up the vertical projection of the prism D; and then, by joining the proper points by straight lines, the vertical projection of prism D will be completed.

The parallelogram $i_3\ l_3\ k_3\ m_3$ in Fig. 248 will be the vertical projection of the base of the prism D; the sides of the parallelogram $g_3\ p_3\ h_3\ n_3$ are the lines in which the lateral faces of the two prisms meet; the polygons $i_3\ g_3\ h_3\ k_3$, $l_3\ p_3\ m_3\ n_3$, and the parallelograms $g_3\ i_3\ l_3\ p_3$, $h_3\ k_3\ m_3\ n_3$, represent the lateral faces of the truncated prism D.

The two projections of the prism C and D, given in Figs. 248 and 249, have little or no value as working drawings, because all the lines in the vertical, and nearly all the lines in the horizontal projections of the prism D, are foreshortened, and therefore the true lengths of the edges of this prism, and the true angles which they form with the edges of the other prism, cannot be seen; also the lateral faces of the prism C are foreshortened, and therefore—although we can see the true height of these faces—we cannot see their correct width. But since we are often compelled to draw some of the mechanism of machinery in oblique positions, similar to that shown in Figs. 248 and 249, it is abolutely necessary that the solutions of problems of this kind should be thoroughly understood.

When only such projections are given as shown in Figs. 248 and 249, without a projection similar to that shown in Fig. 247, then, in order to obtain the true length of the edges, or the true dimensions of the prism, we must employ the method given in Problems 40 and 41.

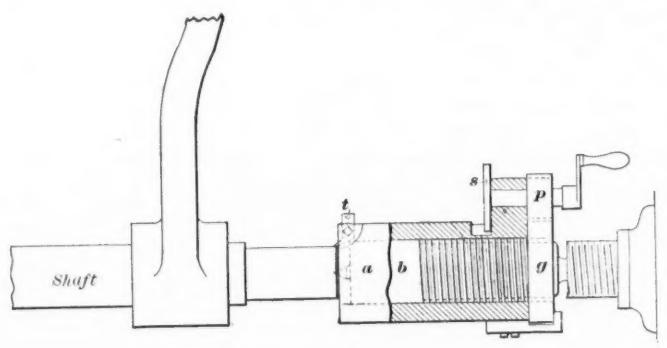
Directions.—In the space marked Prob. 45, find the vertical and horizontal projections of two truncated prisms having the same dimensions as those given in the illustrations. The edges represented by the lines $f\ h$ and $h\ k$ in Fig. 247 must form with each other an angle of 120 degrees; and the line $p_2\ m_2$ must form an angle of 30 degrees with the ground line $A\ B$. Use a 3-inch scale.

LETTERS FROM PRACTICAL MEN.

Tumbling Shaft Tool.

Editor American Machinist:

Herewith find inclosed a sketch of an arrangement for truing the ends of a locomotive lifting shaft or other like work, without removing the arms or blocking up the lathe. The device originated with E. S. Grevsel, our general foreman, by whose permission I am permitted to submit it to the American Machinist. It may be made with a taper shank to fit the center hole as shown, or made to screw on to the spindle thread. Referring to the drawing, b is the shank tapered at the end to fit the spindle and provided at the other end with a center upon which the shaft is placed. This shank is square threaded up as far as is necessary for the desired amount of feed; a is a sleeve, fitting the shank nicely so as to be movable endways and is made to turn with the shank by a feather not shown; g is a gear wheel, threaded to fit the square thread of the shank. Working with this gear is a pinion p. The shaft upon which this pinion is mounted carries a "star feed" s, and the crank handle. As the device revolves with the lathe, the pinion, turned by the "star," turns the gear wheel, which pushes the sleeve out over the shank, thus giving the feed.



Tumbling Shaft Tool.

With this arrangement the ends of the shaft are kept true with their original centers, and the work can be done upon a comparatively small lathe. The arrangement will at once commend itself to those who are blocking up lathes for this job, and I am led to believe there are many doing this.

Lee C. Sharp.

Plattsmouth, Neb.

Machine Drawing.

Editor American Machinist:

It seems to me that Mr. C. A. Smith's able contribution in the American Machinist of Sept. 3, tends to give the impression that all teachers of mechanical drawing are far behind the times. As one of these teachers I wish to protest against such apparently unqualified condemnation of teachers' methods. Descriptive geometry in itself forms but a small part of a student's work in a technical school. Much time should be given to advanced mechanical drawing, which may properly be termed machine or construction drawing, after the student has mastered the principles of descriptive geometry. With such a system there is no difficulty in teaching business methods of machine drawing. Where practice differs from the teachings of descriptive geometry there are good and sufficient practical reasons for the difference, as illustrated in Mr. Smith's article. The changes are not great and do not reflect on the value of descriptive geometry as a study any more than the infrequent use of oblique intersections, etc., proves them to be of no value to the student. If he gains nothing else he learns accuracy of execution.

I have taught machine drawing for several years on almost exactly the basis which Mr. Smith advocates, and I do not believe that this school is alone in that respect. The best practice is followed as closely as practicable, the drafting room and shop working together. All machine drawings are made to a scale, and are working drawings When they are of machines which are to be built in the shop the originals are made on paper from which prints can be taken directly, or else a tracing made from a pencil drawing is retained as the original. The positions of different views are as advocated by Mr. Smith, and shade lines are applied according to the "draftsmen's method." The student has at hand numerous examples of the practice of prominent builders at home and abroad, and if he graduates with any "pedantic" ideas it will not be the fault of "teachers' methods."

In conclusion I wish to express the opinion that the use of such terms as "plan" and "elevation" or "top view" and "side view" is practically of very little moment. However, the former are well established terms, and while we continue to use the architect's scale perhaps it would be well to continue to apply the terms as he does.

A. T. Woods.

University of Illinois, Champaign.

The Boat Problem.

Editor American Machinist:

In your issue of August 27th, "S. S. C., Jersey City," asks about two boats being pulled to shore by two ropes, etc., and you say that the boat pulled by one man will make shore first, because of the weight of man in boat pulled by two men.

Now, I may be wrong, but I believe if, in the case of the boat pulled by two men, one of them simply holds his end of the line, that the other boat will land first, and if both men pull hand over hand that their boat will land in a little more than half the time consumed by boat pulled by one man, allowing the "little man" time for the weight of the one man.

I also believe that if the boats were of the right size to make the one with man in pull just double as heavy as the other one, that they would "get there" at the same time.

And this is the way I reason the case: There are 200 feet of rope between the boat and the shore in each case, and if a weight is placed in empty boat equal to weight of man in the other, and supposing the man in the boat simply holds his end of the rope, the two men on shore will have to expend exactly the same amount of energy to land their respective boats, and they being of equal strength, and all other things being equal, they would, in my opinion, reach the shore at the same time.

But now if the man in the boat is pulling at the same time hand over hand, instead of simply holding his end of the rope, what will become of the energy expended by him?

I can see that if one boat reaches the shore before the other that there will be more strain on rope because of the increased speed, and that this increased strain on rope must be maintained by each man individually; and yet I liken this case to one wherein three men are in two boats, they being of equal weight and strength, two being in one boat and the third man being alone, but having a weight in his boat equal to his own weight, which would make the load in the two boats the same, and of course with a pair of oars for each man, in going a given distance the boat with two men in would make the quickest time. Now I call these parallel cases. Although it is not quite clear to me; I think you must be right in the matter, but, although it will not probably prove to be of any material advantage to me to know, I would like to be enlightened a little on this point, provided you do not consider that my "asking" and your "enlightening" take too much valuable space in your columns. F. R. H.

[Our correspondent is wrong in his belief that the time consumed by two men—one standing in the boat, the other on shore

—in pulling a boat to the shore will be less when both men are pulling hand over hand, than when one man is simply holding, and pulling at one end of the rope, while the other one is pulling hand over hand.

To pull a boat through a given distance and time to the shore will require a force of a certain magnitude; if the magnitude of the force and the distance is not changed, a difference in the time in pulling the same boat to the shore cannot occur. The question now to be answered is, will the magnitude of the force expended in pulling the boat to the shore remain the same in both cases? To this we answer, Yes, because the magnitude of the force required to pull the boat to the shore is represented—so to speak—by the amount of pull on the rope; that is, the force which tends to tear the rope asunder. Now, it must be self evident that when two men equally strong pull with all their might, the pull or force on the rope will be of the same magnitude when only one man is pulling hand over hand, as that when both men are pulling hand over hand. Therefore the time consumed in pulling the boat to the shore must remain the same in both cases, and no more energy will be wasted in one case than in the other. The case which our correspondent calls a parallel case is not a parallel case, because in this case the energy of both men is expended in pulling the boat to the shore, the reaction of their united force taking place in the water; whereas in the former case the energy of one man is consumed in resisting against that of the other man.]

Melting in a Small Cupola.

Editor American Machinist:

Having from time to time noticed items concerning small cupolas in your valuable paper, of which I am a constant reader, I will give you a description of heat taken at my foundry Sept. 23d.:

Outside diameter of cupola, 26″.

Thickness of lining, 4″

Largest inside diameter at melting point, 20″.

Height from bottom plate to charging door, 5′ 6″.

Height from bottom to tuyere, 10″.

Height from sand bottom on back side, 6″.

Style of tuyeres, 3½″x1½″ oblong.

Number of tuyeres, 2.

Blast furnished by 20″ blower, running 2,000 revolutions.

Blast conveyed through 4″ pipe, 67 feet.

Bed of 100 lbs. of Connelsville coke, 800 lbs. iron.

First charge, 50 lbs. Connelsville coke, 400 lbs. iron.

Time of starting fire.....	12.45	P. M.
Charging first iron.....	2.15	"
Blast put on.....	2.25	"
First appearance of fluid iron..	2.35	"
Bottom dropped.	3.15	"

Ratio of iron melted, 1 to 8.

The first castings were five heavy grates weighing 145 lbs. each, and balance of heat was ordinary machinery castings for general jobbing. We could have used two more charges in the same proportion, with equally as good results. We have made several castings weighing from 360 lbs. to 410 lbs., and think our small cupola indispensable for breakdown jobs where castings are wanted quick and at small expense.

W. G. Sutherland.

Edmore, Mich.

Welding Brass to Iron.

Editor American Machinist:

Referring to your answer to question 405, regarding knitting brass to cast-iron, I have had some experience in knitting or welding phosphor bronze to wrought-iron, which may be of benefit. How it will work with cast-iron I do not know, but with wrought-iron there will be a hole under riser; the height you may have of riser head or size of riser, does not seem to have any sure effect. In my experience I had rather see a hole under riser than not see one, as then I know just where the joker is, and can burn in with some hot metal of the same kind, and make it as sound as a dollar. F. B. can very likely treat his in the same way; that is, burn in where hole is with hot metal, same as is often done with cast-iron when defects are to be remedied.

To heat the iron is, of course, necessary, and as hot as possible to allow of equal contraction; but there is something about that blow hole or shrink hole under the riser that has mystified me not a little. I have tried all kinds of methods to prevent it, and the first trial after a new experiment it would, perhaps, be sound, and I would begin to feel like shouting Eureka, when, the second time trying, I would find I had been pouring metal around that same old hole or the hole had got there some way. At last I thought I would try burning in a piece where the hole was; well, I came, I saw, I conquered right there and then, and a hole in a brass casting is about as much trouble as it would be in the bottom of a tin pan—the metal does not get harder when burnt in, and finishes same as rest of casting.

Foundryman.

More About Canal Locks.

Editor American Machinist:

In the line of the discussion on the canal boat problem, the following occurs to me: The fact that it takes the same amount of water to "elevate" the large boat that it does the small one is perfectly consistent with the theory of a mechanical equivalent, for the following reason:

Suppose the lock to contain, at low water, exactly 100 tons of water, and a boat weighing 80 tons be drawn in. Just exactly 80 tons of water, according to old man "Eureka," will be forced out; and there remains in the lock, when the gates are closed, 20 tons of water and 80 tons of boat. When the water is let in, just 100 tons are raised to the top of the lock.

On the other hand, if the boat only weighed 20 tons, there would then be in the lock 20 tons of boat and 80 tons of water, or 100 tons in all—the same as before—and, of course, it ought to take the same water to do the lifting. J. L. M.

Double Geared Shapers.

Editor American Machinist:

Concerning the Steptoe shaper, described in issue of October 8th, I wish to say that the addition of the double gearing, which consists of two racks, one on each side of the ram, two rack wheels and double pinion, with the rack set so that the tooth on one side is opposite the space on the other side is no new departure, but has been used first by me in the 25″ shaper which I designed for the Hendey Machine Company.

Rudolph Peter.

Crude Petroleum for Steam Making.

The Tannite Company, at Stroudsburgh, Pa., are trying the experiment of burning crude petroleum under their boilers. Referring to this the *Jeffersonian* says:

The oil used is crude petroleum from Lima, Ohio, and the fittings are of the simplest description and of comparatively slight cost. The oil is carried under ground from a reservoir over one hundred feet distant from the boiler house, a one-inch steam pipe having the capacity to supply two boilers. A half-inch pipe conveys the oil to each boiler, and this pipe before reaching the boiler is connected with a steam pipe in such manner that streams of steam and oil enter together into a small cast-iron retort in the center of the fire box. In this retort, kept at a high heat, the steam and oil are converted into gas, and to all appearance gas is the fuel, and not liquid. The fire is easily managed, and there is great saving of labor due to entire absence of ashes. The company are not prepared at present to make any statement as to the practical results, but careful and repeated trials are being made, and it is thought that in a few weeks exact data can be furnished.

Jigs and Fixtures.

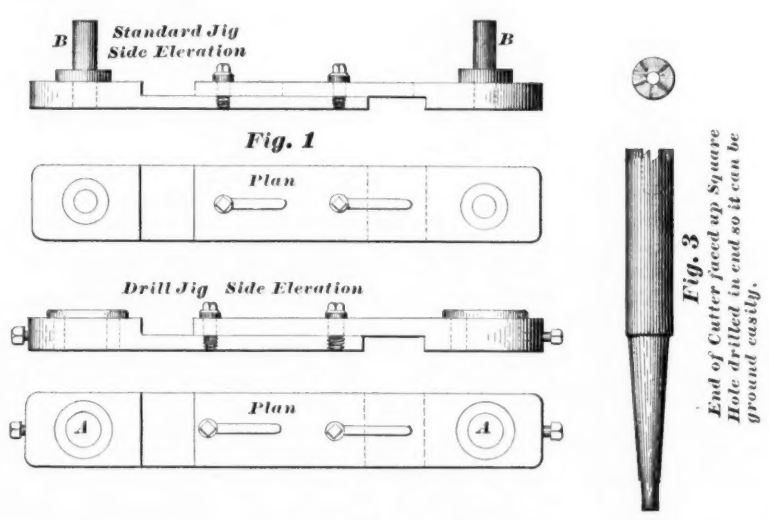
By John J. Grant.

There is no doubt that thousands of dollars are annually thrown away in shops of even moderate size, that might be saved by the judicious use of a few inexpensive jigs and special fixtures, in some of which the entire cost of manufacture could be saved in once using. In fact, it is often much easier to lay out and bore a jig that can be strapped to the face-plate of a lathe than it is to attempt to get the holes in a heavy casting correct without it. For instance, holes that have to be of a positive or fixed distance apart for shafts having spur gearing on them, when sometimes the $\frac{1}{1000}$ part of an inch will make the gearing either run good or bad.

Of course, in making jigs and special fixtures the first thing to be thought of is: Will it pay? This is easily answered in shops doing a large amount of work in duplicate. In such shops the first cost of the tool or jig is hardly ever taken into account, but will it produce either work of a better quality or more of it? In a small shop, however, where only a few pieces of a kind are made, and often but one, the question becomes more difficult to answer, and this is where the skill of the manager or superintendent comes in. Sometimes it will pay to make a cheap jig when there is a limited amount of time to finish a job, and by so doing the main part of the work can be going on in some other machine or part of the shop. In such a case the fixture or jig, combined with the amount of labor necessary to finish the piece it is intended for, may cost more than to do the work without it, and yet the facility with which the job is accomplished may overbalance the cost.

No better illustration of the value of special tools, fixtures, and jigs can be given than the modern factory for the manufacture of guns, pistols, and sewing machines, where they have been brought to a high state of perfection, and by their use make it possible to sell such articles, so well made, at so low a price.

It is evident that jigs would be enhanced in value in small shops if they could be universal, or partly so, in their application to work. With a little study a great many useful tools, fixtures, and jigs can be so made, for instance, the modern "Scotch" drill with its "old man," and various clamps and dogs, or the more recently designed universal drill driven by the flexible shaft or the roundabout rope. It is astonishing to go into some shops and find that they are entirely ignorant of the existence of such arrangements, or, where they have already purchased them, don't half know their value as labor saving appliances.



Jigs and Fixtures.

It is a difficult job to lay out shaft holes, where there is no chance for adjustment, and in which shafts are to run having spur gears, especially if the machinery is fine and requires still running accurately cut gearing.

It is comparatively easy, however, if a pair of jigs made same as illustrated in Figs. 1 are used. These jigs, being adjustable as to distance from center to center, can be used for various sized wheels, with the advantage of being able to test the running of a pair of wheels before the second or drill jig is set.

Bushings of various sizes to fit hole *A* and thimbles or collars to slip over stud *B*, make the jig universal. The stud *B* can be removed and a bushing used instead where it is best to drill both holes at one setting. The advantage of simple jigs like these is apparent at a glance, as the workman has simply to select bushings to suit the holes in the pair of wheels to be used and adjust the distance on the standard jig, Fig. 1, so that the wheels run together correctly, remove the bushings from the pins, place collars on the pins the size of the holes to be drilled for the shafts, and fit bushings to jig below, right for shaft holes, slip the drill jig over the standard and fasten with the clamp screws, and it is ready to clamp to the work to be drilled or bored. Should the holes in the casting be cored, a tool made same as in Fig. 3 will bore them near enough for the reamer, even though the cores are not central.

It is well to have this style of jig made in two or three lengths, as a long one may be in the way. Where a train of gearing is used as the driving gear of a planer, it is only necessary to set one pin after the first pair of holes are drilled or bored. A pin is placed in the hole in the jig and dropped into the last hole bored, and so on until the holes for the entire train are finished. A set of bushings for the standard jig, all having the same diameter hole, the external diameter varying by $\frac{1}{16}$″ from 1″ to 2″, and by $\frac{1}{8}$″ from 2$\frac{1}{8}$″ to 3″, of cast-iron, can be made by a good boy in two days, and bushings of the same material and dimensions for the drill jig for the same cost. The jig will last a lifetime in a shop not using it perhaps oftener than once a month.

There has been great improvement in many shops in regard to the use of such tools in the last few years, and as the young men who have served their time in large shops, fitted with all modern improved fixtures and jigs, branch out for themselves we may expect to see more of them in use. I consider no shop, no matter how small, making machinery or doing a decent line of repairing, complete, no matter how perfectly they may be fitted with modern machinery, wthout a decent amount of special fixtures and jigs.

According to *Engineering*, some experiments were recently conducted in Portsmouth dockyard, with a view to determining the resistance of metals at different temperatures.

The results indicate that the strength of iron increases uniformly up to 500 degrees Fahr., while the ductility diminishes up to about 300 degrees Fahr. It then increases until a somewhat higher temperature is reached, and then remains nearly constant up to a temperature of 500 degrees.

Steel, subjected to a similar test, showed no diminution of strength up to 500 degrees; but at this point its ductility was reduced one-half.

The exhibition of the American Institute is now open, but, as usual, exhibitors are slow in getting their exhibits in place. When the space taken is more fully occupied we shall pay attention to the mechanical part of the display. As we previously intimated, electricity in its various uses will occupy a good deal of the space, which shows its growing importance as an economical agent.

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CONTENTS.

	PAGE
New Buffing Frames	1
Wilson's Spark Arrester	1
Hot Air Heating and Ventilation	1
Delaying the Issue of Patents. By R. G. Du Bois	1, 2
The Alignment of Line Shafts. By Fred. J. Miller	2
Improved Machine Tools	3
Babbitt Metal	3
Air Compressor Attachment for Locomotives	3
Deputies of the N. A. S. E.	3
Foundry Flasks or Boxes. By S. Bolland	4, 5
A New Mechanical Instrument	5
Fox Turret Lathe	5
Practical Drawing. By J. G. A. Meyer. Thirty-fifth Paper	5, 6
Letters from Practical Men—Tumbling Shaft Tool. By Lee C. Sharp—Machine Drawing. By A. T. Ward—The Boat Problem. By F. R. H.—Melting in Small Cupola. By W. G. Sutherland — Welding Brass to Iron. By Foundryman—More About Canal Locks. By J. L. M.—Double-Geared Shapers. By Rudolph Peter	6, 7
Trade Catalogues	8
Making a Bridge of Superintendents and Foremen	8
Steam Yacht Races	8
Questions and Answers	9
Manufactures	9
Machinists' Supplies and Iron	10

Trade Catalogues.

Trade catalogues in this country have the merit of being got up without much regard to cost, rich in displays of the engraver's art and models of typographical skill. So far they are well done, for they are substantially useless if not in some sense works of art. But in the main they have the weakness of not telling anything. In way of illustration, they are very generally confined to perspective wood-cuts, which are indispensable in the way of giving a general idea of the machine represented, but which stop short of giving the information a prospective purchaser is most interested in.

The stereotyped phrases of "large and long bearing surfaces," and "ample strength," tell nothing whatever. They are as meaningless as "great capacity" and similar expressions. They may be true from the manufacturer's point of view, but the intelligent purchaser wants to judge for himself, from actual knowledge of important dimensions; he looks with distrust upon protestations that are to him meaningless.

A shrewd salesman in the machinery line acquaints himself with the distinctive features of the machine he is selling; features that make it presumably better than other machines of the same type. And these features he very properly dwells upon when discussing its merits. He does not rely upon assertion that his machine is better than others; he tells what there is about it that makes it better. He would be looked upon as deficient in common sense if he tried to cover up features of construction that secured superiority, or if, indeed, he did not make these features prominent. Now any showing up of that machine through the engraver's art ought to include the features which the salesman would dwell on, otherwise it is incomplete.

Most new machines are not new in type, but they presumably have something that differs from others of the same type, and their sale is frequently based upon that something. Above all, that is what should be shown. The pictures of two engine lathes, for example, may be as like as the two proverbial peas, yet one may possess some point of excellence, hidden in the general view, that makes it far superior to the other. That point of excellence is just what should be shown. That may be all that will induce a second look at the engravings. It is but little use to say that by virtue of its construction it will do so and so. The man who has any interest in it wants to see for himself why it will do it. Often a few detail cuts—inexpensive reproductions of drawings on a reduced scale—will make the whole matter clear, and along with the finished wood-cut will interest those whom it is important to interest.

The objection is sometimes made that detail engravings give away secrets that it is desirable to keep. We could never see the sense of this argument. The idea that an intelligent mechanic cannot find out all he desires to know about a machine that is put on the market appears to be absurd. But if the machine is shown in all its essential details in a way to make a public record, no one is very likely to copy even unpatented parts. No one likes to put himself before the world as a mere copyist, except in a legitimate way. Giving the widest publicity to one's ideas—in machinery or anything else—is generally the surest way to prevent their appropriation.

We only use the foregoing argument in favor of details of machines that mark some difference in construction as between other machines in other respects the same. The showing of details may be made fulsome, as when it does not tell anything of importance, or anything that would not be naturally surmised. But when it can be done so as to add important information it seems a grave mistake not to do it.

Since the publication in our columns of the communication from John A. Hill on oil cans, and one or two others that followed it, we have received descriptions and sketches of all sort and conditions of oil distributors; so many that we despair of publishing them. Some of the cans described and sketched—perhaps all of them—are good. Several of them have heavy cast metal bottoms to protect the lighter sides from injury, and incidentally to keep them in an upright position. All sorts of vents to avoid leakage of oil are provided, one and the simplest being a spiral groove around the cork. A few of these cans are patented; more of them are not. This array of oil cans leads us to believe that the makers of really good oil cans have not put their wares on the market to any extent.

An oil can in common use that will not leak oil will pay for itself in the saving of oil, waste and time about three times a week. The average oil can in use is about the poorest mechanical contrivance to be found.

Making a Bridge of Superintendents and Foremen.

The *National Car and Locomotive Builder* refers at length, editorially, to an evil in railroad matters of serious import where it exists, viz., the direct interference of the management in mechanical matters instead of through the proper channel, the head of the mechanical department. We had not supposed this weakness existed to the extent our contemporary points out, and cordially endorse its views as to the evil—always evil—results of such practice. The general master mechanic or superintendent of motive power of a railroad is presumably appointed to that position because of his ability to properly fill it, and in all decency and justice so long as he holds that position any interference with departments or men under him should be made through him: when this plan will not work, then that road needs another head to its mechanical department. The traveling public is interested, as well as the management, in the maintenance of the motive power of a railroad, and so long as petty interference of general officers is the rule it may be set down as reasonably certain that the head of the mechanical department works for the pay he gets, and without much interest in results. Such interference is, of course, a sign of weakness of general officers, and is always so set down, but this does not mend the case.

Sometimes this matter of interference gets down below the general offices and into the shops, where it works no better. One of the most successful general master mechanics of his day once remarked, in the hearing of the writer, that nothing, unless to save human life in an emergency, could induce him to interfere with any department in his jurisdiction except through the head of that department. Of course his plans were carried out and his mechanical ability impressed upon every piece of work done, but so quietly that no one outside of a few heads of departments ever had occasion to know of his existence. We recollect seeing him pass daily for two months through the shops of the company before learning that he was general master mechanic.

We do not think this evil exists, to anything like the extent complained of, in manufacturing establishments. In fact, we do not think it would be possible to successfully conduct such establishments in close competition with others on a basis of this sort. In such establishments as a rule the manager and superintendent are as zealous of the dignity and rights of foremen and heads of departments under them as these men are themselves, which is simply saying that there is system in the way things are done, and a getting of the best efforts of everyone who superintends operations. There are exceptions to this, but they are rare and becoming rarer every day. Heads of departments in manufacturing establishments in this country are supposed to be competent to carry out instructions and keep the work along according to the general policy of the shops until it is proved to the contrary, when they are displaced, which is the only proper thing to do, and the only thing it pays to do. When a bridge is made of such men by dealing directly with workmen instead of through them, their interest at once ceases, and if they submit to it it is reasonably certain that it is because they are more disposed to take life easily than to do anything else. The best efforts of such men are paid for, are necessary to success, and common sense dictates that they be treated as men competent to carry out the part of the work entrusted to them. A contrary course is equivalent to an admission that very poor judgment has been used in their selection.

Steam Yacht Races.

The greatest excitement of the last month, the race of the Volunteer and Thistle, has passed away with the victory of the former. It is gratifying to national pride to know that our yacht builders can hold their own, and, perhaps, a little more, against the greatest designers and builders of such craft in the world. Further than this, yacht racing is doubtless rare sport for those who can afford to indulge in it, and when, as in this instance, the contest is an international one, the interest, by reflection, is very general, and the satisfaction universal when the right boat wins; which boat wins makes all the difference in the world. It may with truth be urged that such contests settle nothing of great importance, and that they do not afford recreation to those who most need it; still the very general interest in them doubtless serves a useful purpose in diverting thought for a little time at least from the humdrum affairs of life. And the example of the manly way in which the vanquished Thistle representatives accept defeat, and the modesty with which the friends of the Volunteer take their good fortune, is a good one.

There is one kind of yacht racing in which representatives of the two countries might indulge, and which, perhaps while not equal as a matter of sport, would have more valuable results. We refer to an international race of small steam yachts. We venture to say that much valuable information could be derived from such races. If interest in them was more quiet in its nature it would be even more general, and the progress made would undoubtedly be of a good deal of value. The evolution of the steam launch for steamships and its improvement for many other purposes would not unlikely grow out of a series of such races.

It seemed that a good sized stride in telegraphy had been made when telegraphing from moving railway trains was established. But now that passengers are to be provided with facilities for using the telegraph to communicate between moving trains there does not seem much more to ask for in this respect. What with drawing room cars, dining room cars and sleeping cars, all with luxurious appointments and excellent attendance, there is not much objection, so far as comfort is concerned, to living altogether on the road. There would be some excuse if we became a race of nomads.

When Chauncey Depew said, as he did recently to the reporters of the daily press, that this country was one hundred years ahead of England in railroading, he undoubtedly expected to be figuratively understood as far as time is concerned. And doubtless he referred more particularly to train service than to other matters connected with railroading. He would probably agree with every fair-minded American that British railway permanent ways were far ahead of those in this country, with one or two possible exceptions, and that signal service there is much better than here. With a few trifling errors which may be set down to pardonable love of home institutions, intensified by absence, and a pretty large rebate of time, Mr. Depew was probably correct in his statements.

There is more than the usual activity amongst would-be train wreckers. From the East and West we hear of the doings of

track obstructionists. The law deals too mildly with monsters of this class. There is no possible use in this world for such men, and this ought to be set down as an axiom, whether their attempts are successful or not.

Practical Electricity is the name of a new monthly journal devoted to matters indicated in its title. It is published at 73 Richardson's Building, Boston, Mass. The first numbers present a very creditable appearance.

Questions and Answers.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common-sense methods.

Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials nor location will be published.

(420) J. J., Pasadena, Cal., asks: 1. Is it practicable to make well and water pipe by hydraulic or pneumatic riveting machinery? *A.*—We believe it to be practicable. 2. Would it be practicable or economical to heat tar for dipping pipes by a steam jacketed kettle? We are at present using cordwood. *A.*—Yes.

(421) C. S., Boston, Mass., asks: Do marine engines need to develop more power to propel a boat at a given speed than would be developed by an engine moving upon rails, and drawing the boat through the water at the same speed, or a stationary engine drawing it by means of a winding drum and cable? *A.*—Yes, because by placing the engine on the boat more water will be displaced, and consequently the power necessary to propel the boat will also be increased.

(422) J. H. C., Allegheny, Pa, writes: I have been hunting further information on friction couplings than that of your June 11th issue, but can find none even in "Weisbach" quoted. The question is, Will not a cast-iron rim of 15° taper with the shaft, and 24″ largest diameter, 3¼″ face, drive more than one 18″ diameter, both having end pressure (to engage) 1,100 pounds? The other part of coupling would be made of babbitt metal, and would make about 50 revolutions per minute. *A.*—Yes, because the larger the diameter of the friction coupling, the greater will be the leverage with which the friction acts.

(423) L. L. K., Keasing, Neb., asks: Will I save steam or use it more economically by changing the cut-off of my engine—which is 11″x16″, and now cuts off at 13 inches and making 135 revolutions—to cut off at 9 inches, and speed it up to 160 revolutions, changing the size of pulley on line shaft to suit different speed? *A.*—By making the changes as you suggest, you will save steam; but whether you can do so depends upon the design of your engine; you will have to add lap to the valve, and you may have to increase the throw of the eccentrics. Will you have room to do so, and will the steam chest be long enough to admit a larger valve?

(424) J. F. K., Chicago, Ill., asks: 1. Is there any book giving rules for setting calipers? *A.*—We know of no such book. 2. How should the outside calipers fit or touch the inside ones to make different kinds of fits—say a working fit or a driving fit? Then how should the calipers touch the work turned to fit the hole—just barely touch, or a little stiff? *A.*—This is a matter about which no directions can be given which will be of any service. The practice of different mechanics, equally expert, varies very much in the matter of contact of calipers with each other and with the work 3. Is there such a thing as taking lessons in calipering? A.—Not in the sense you mean. The only lessons in calipering which can be of any benefit are those gained by actual experience on the lathe.

(425) G. H. P., New York, writes: Can you give me a receipt for gluing rubber to cast-iron to stand the action of salt water. I think I have seen something of the kind in one of the back numbers, but cannot find it now; if it has been in the paper, please give me the number and volume of issue. *A.*—The answer relating to this subject, and which you think you have seen, will be found in the issue of September 24, 1887, question 388. This receipt may answer your purpose; if not, try the following: Soak pulverized gum shellac in ten times its weight of strong ammonia, when a slimy mass is obtained, which in three to four weeks will become liquid without the use of hot water. This softens the rubber, and becomes, after volatilization of the ammonia, hard and impermeable to gases and fluids.

(426) W. T. R., San Antonio, writes: Would you kindly inform me what is the composition used in the manufacture of matches? As regards safety matches, I suppose it is phosphorus and iodine, but would like to know particulars. *A.*—Among the many kinds of mixtures for matches we notice the following: For sulphur dips: Phosphorus, three parts; glue, six parts; sand, one part; incorporated below 100° Fahr., with ten parts of water. Or phosphorus, five parts; fine sand, four parts; red ochre, one part (or ultramarine), ½ part; gum arabic, five parts, in six pints of water (or four parts of glue in nine parts of water). For stearine dip: Phosphorus, three parts; brown oxide of lead, two parts; turpentine, ¼ part, softened in three parts water. Instead of the brown oxide, two parts of red lead, stirred up with ½ part of nitric acid, may be used. If you intend going into the manufacture of matches, would advise you to engage a first-class chemist.

(427) A. B. S., Memphis, Tenn., writes: My idea is to increase the temperature of the feed-water before it enters the boiler by causing it to circulate through a coil of 2-inch pipe, placed between the front and back bridge wall, just below the top (about 2 inches), so as not to interfere with the draft in any manner. Enclosed you will find a sketch of the pipes, boiler, and position of pump. (This sketch shows a pipe running direct from the pump to the coil, with a check valve near the pump: to this pipe, between the check valve and the boiler, is attached another pipe—marked 27—running into the back end of the boiler; pipe 27 has a globe valve—marked 30—close to the end of the boiler. To the other end of the coil is attached a pipe—marked 29—running into the front end of the boiler. Pipe 29 has also a branch running into a mud drum. A globe valve is placed on pipe 29, so that the water can be made to flow into the boiler or into the mud drum.) I am satisfied that the water would circulate through the coil all right as long as the pump was running; but when the pump is stopped, I am not so certain as to what would take place; hence the following questions: 1. If the pump is stopped, and the globe valves on pipes 27 and 29 left open, would the water circulate through the coil, starting through pipe 27 and go out through pipe 29? *A.*—No. Since the answers to the other questions depend on a proper circulation through the coil, we believe it to be unnecessary to answer the remaining questions; but it may be said that the arrangement of your pipes is dangerous, and should not be used.

(428) W. S., St. Louis, Mo., writes: 1. I have an open heater, 5′x6′, that I use for heating feed-water for a boiler, 50″x20′, and have four 8x10 elevator engines, and three No. 4 Blake pumps exhausting into the same. Temperature of feed-water now is 200° F. I have decided to put 1½″ coil in heater, and the only means of getting the same in heater will be through a manhole, 9¼″x15″. I am in doubt as to how many feet of 1½-inch iron pipe it will require, so that I can obtain the same temperature of feed-water. *A.*—The total amount of heating surface in the coil will depend upon the rate of evaporation of water in the boiler, which you have not given; but you will require about one square foot of heating surface in the coil for every 30 pounds of water evaporated per hour. 2. Give necessary advice as to the best form, position and construction of coil. *A.*—Let the iron pipe composing the coil follow the sides of the tank; and since the hole through which the coil can be placed into the heater is small, you will probably have to put the coil together (using elbows for this purpose) in the tank. 3. Which would you recommend to have pump work—hot or cold water? *A.*—Cold water, whenever that is possible. 4. How many square feet of heating surface are there in 2 feet of 1¼ pipe? Give general rule for ascertaining the same. *A.*—The general rule for finding the heating surface of a pipe is to multiply the outer circumference in inches of the pipe by the length in inches, and divide the product by 144; the quotient will be the number of square feet of heating surface. Thus: To find the heating surface of a pipe 2 feet long and 1¼″ outside diameter; the circumference of a circle 1¼ inch diameter is 4.712, and

$$\frac{4.712\times 24}{144}=.785+$$

square feet of heating surface. We believe that, instead of multiplying the outer circumference of the pipe, it will be nearer correct to multiply the circumference through the center of the thickness of metal by the length.

Business Specials

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

Gear Wheels. See Adv., page 16.

Link-Belting.

Send for catalogue of Link-Belting.

Over 50,000,000 feet of Link Belt in use.

Link-Belt Machinery Co., Chicago and N. Y.

Shafting Straighteners. J. H. Wells, Tampa, Fla.

Steel Name Stamps, etc. J. B. Roney, Lynn, Mass.

Air Compressors, Rock Drills. J. Clayton, 43 Deyst., N. Y.

Exhaust Tumbl'g Bbls. Henderson B's., Waterb'y, Ct.

Upright Drills from 20″ to 36″ inclusive. Currier & Snyder, Worcester, Mass.

For Improved Cooper Stoves, send to Variety Machine Co., Warsaw, N. Y.

Light articles built to order by the American Sewing Machine Co., Philadelphia, Pa.

The Best Upright Hammers run by belt are made by W. P. Duncan & Co., Bellefonte, Pa.

R. Dudgeon, 24 Columbia st., New York. Improved Hydraulic Jacks and Roller Tube Expanders.

Pattern and Brand Letters. Vanderburgh, Wells & Co., cor. Fulton and Dutch sts., New York.

Solid Nickel-Seated "Pop" Safety Valves. Consolidated Safety Valve Co., 111 Liberty st., N. Y.

Davis Key-Seating Machines, kept in stock, by Manning, Maxwell & Moore, 111 Liberty st., N. Y.

"Bradley's Power Hammers, the best in the world." 20 sizes. Bradley & Co., Syracuse, N. Y.

Ice and Refrigerating Machines, 124 built, and all successful. David Boyle, 521 Monroe st., Chicago, Ill.

Selden Packing, for stuffing-box, with or without rubber core. Randolph Brandt, 38 Cortlandt st., N. Y.

Drawing Materials, all kinds. Get catalogue. Mention this paper. G. S. Woolman, 116 Fulton st., N. Y.

The Improved Tabor Steam Engine Indicator, made and sold by The Ashcroft Mfg. Co., 111 Liberty st., N. Y.

Queen Lubricant, a general tool lubricant, costing 3 to 5 cts. per gallon. Eureka Mfg. Co., foot E. 26th st., N. Y.

Engine Lathes, Hand Lathes, and other fine tools. Assortment large; prices low. Frasse & Co., 92 Park row, N. Y.

Nicholson & Waterman, Fine Engine Lathes, Nicholson & Waterman, Boring Mills. Nicholson & Waterman, Providence, R. I., Bolt Machinery.

Curtis Pressure Regulators, Curtis Return Trap, Curtis Damper Regulator. See Oct. 8, p. 15. Send for circular No. 17. Curtis Reg. Co., Boston, Mass.

Machinists' supplies, brass goods, m'f'rs' supplies, polishing materials, all kinds wire, metals, etc.; in any quantity. Jordan & Gottfried, 208 Canal st., N. Y.

For Best Return Steam Traps, Pressure Regulators, Positive-Acting Pump Govs., Back-Pressure Valves. T. Kieley, 11 W. 13th st., N. Y. Send for des'n.

W. H. Hoffman, consulting engineer, 94 Liberty st., N. Y. Mechanical engineering in all its branches; working drawings for the transmission of power by steam, water, air and electricity.

Hot Water Supply. A practical treatise on the fitting of hot-water apparatus for domestic and general purposes. By F. Dye. 82 pages, with 25 illustrations. 12mo., cloth, $1. Send for catalogue. E. & F. N. Spon, 35 Murray st., N. Y.

"Indicator Practice and Steam Engine Economy." By F. F. Hemenway. Contains plain directions for using the indicator, and making all required calculations from the diagram; also the principles of economy in operating steam engines, and current practice in testing engines and boilers. Price, $2 post-paid. Published by John Wiley & Sons, 15 Astor Place, New York.

"Binders" for the American Machinist. Two styles—the "Common Sense," as heretofore sold by us, and mailed to any address at $1.00 each, and the "New Handy," mailed at 50c. each. The former has stiff board covers, while the latter has flexible covers, the full page opening flat. Either will hold the entire 52 issues of any volume. American Machinist Pub'g Co., 96 Fulton st., New York

Manufactures

The Grant Locomotive Works at Paterson, N. J., are being rebuilt.

Charles A. Finlay is interested in building a furniture factory at Lake City, Fla.

The Maysville (Ky.) Water Company contemplate improvements, including a new pump.

George Ringler will make an extensive addition to his brewery at 213 East Ninety-first street, New York.

The Cameron & Barkley Company has been chartered at Charleston, S. C., to build engines and boilers.

The Martin Anti-Fire Car-Heating Company, Dunkirk, N. Y., are equipping several trains on different roads.

A company has been formed at Newton, Kan. to build works for making sugar from sorghum by the new process.

The large planing mill being built by R. J. Brandon at Gate City, near Birmingham, Ala., is nearly completed.

The rolling mills at Boonton, N. J., are to be opened in a few weeks under the management of the Arlington Works.

The Roller Chain Belting Company, Columbus, Ohio, has purchased a tract of three acres of land, and will put up shops at once.

The John Abell Engine and Machine Works, Toronto, Ont., have secured the right to manufacture the Reliance safety water columns.

The Brown & Sharpe Manufacturing Company, Providence, R. I., are at present employing 700 workmen—the most, we believe, ever employed at the works.

William Wright, Newburgh, N. Y., has the contract for building the three new engines for the Brooklyn Bridge. They are respectively 30″x48″, 26″x48″ and 24″x36″.

The Babcock & Wilcox Company, New York, sold 4,438 horse power of boilers during the month of September, many orders being the third or fourth, and one the thirty-seventh.

The Washington (D. C.) Gas Company will build a retort house, 60x249 feet, to cost $30,000; an engine room and pumping house, 63x100 feet, to cost $22,500, and two gasometers.

A number of the citizens of Leechburg, Pa., have organized the Leechburg Foundry and Machine Company, and propose to expend $100,000 in erecting a foundry and machine shop.

The large box factory of Maxwell Bros. at Chicago, Ill., was recently destroyed by fire. The same fire damaged the planing mill and sash factory of John G. Lobsten to the extent of $20,000.

A paper and pulp mill, to be the largest in the United States, are being erected at Harper's Ferry, Va., and several foundries, it is said, are to be started. A rapid increase of population is looked for.

A telephone company, with a capital stock of $1,000,000, has been incorporated in Indianapolis. The company proposes to manufacture the telephone patented by Humbert L. Ford, of Washington.

The Universal Radial Drill Co., Cincinnati, Ohio, have removed to their new shop on Eggleston avenue, corner Third and Lock streets. The new building is 72x196 feet, part two and part four stories in height. This about doubles the company's facilities for doing work.

The Clayton Air Compressor Works, 43 Dey street, New York, report largely increased sales. They are doing a good foreign business, one of their late orders being from Japan. Their air compressors are in use in South America, and in most European countries.

The Morganton Manufacturing Company has been organized at Morganton, N. C., and has bought the planing mill of R. G. Ross. They will add a grist mill and machinery for manufacturing buckets, tubs, barrels, churns, etc., and solicit correspondence with manufacturers.

The Rushville (Ind.) *Graphic*, a copy of which we received through the courtesy of W. H. Moffett & Co., gives considerable space to arguing the advisability of at once constructing water-works. The arguments are conclusive, and there is good reason for believing that Rushville will contract for water works without delay.

The Gage Tool Company, Vineland, N. J., who have spent some years in perfecting and bringing out their new wood-workers' plane, are having very gratifying success in introducing it. Although only a short time in the market, they have received their fourth order from one large firm, and orders on hand appear to warrant future large business.

F. E. Meyers & Brother, Ashland, Ohio, well known as manufacturers of pumps and agricultural tools, are building new shops, consisting of foundry, 85x45 feet; warehouse, two stories, 100x45 feet; machine shop, three stories, 50x45 feet; shipping and warerooms, three stories, 85x45 feet; and an office building, 20x30 feet, two stories.

The Pittsburgh *Iron World* says that Pittsburgh steel makers have established agencies for the sale of the finer grades of steel suitable for making cutlery in Europe, India and Australia. Their sales have been so considerable as to practically guarantee an established trade. Steel has been sold in competition with an English-made article at the same price.

The Wheeling *Register* says: "The Ensign Manufacturing Company of Huntington, W. Va., have commenced work on a new car erecting shop, which will be completed by the 1st of November, and will be constructed on the best and most advantageous plan to get out rapid work. The building will be a brick structure, 90x200 feet, and will have five tracks running through it, and will necessitate the employment of 500 additional men when in operation.

Water-works are talked of in the following places—In some instances, the enlargement of present works; in others, new works: Waseca, Minn.; Ortonville, Minn.; Stromsburg, Neb.; East Jordan, Mich.; Winfield, Kan.; Bonham, Tex.; Vineyard Haven, Mass.; Ellensburg, W. T.; Gallatin, Tenn.; Gallipolis, Ohio; Weatherford, Tex.; Ennis, Tex.; La Salle, Ill.; Carson City, Mich.; Lancaster, Pa.; Rice Lake, Wis.; Fayetteville, Ind.

A press dispatch from Birmingham, Ala., says: "Papers were filed to-day to incorporate a very promising enterprise, under the style of the Birmingham Bridge and Bolt Works, with $100,000 capital. The nucleus of it will be the plant of the present Birmingham Bridge Company, which will take $20,000 stock. The Elyton Land Company also subscribes for $20,000 worth, and some New Orleans parties for $40,000."

The Bethlehem Iron Company, Bethlehem, Mass., supply the following information to the *Tribune* in reference to the report that they were purchasing tools and machinery abroad with which to do the work on their government contract: The Bethlehem firm have not been supplied with any part of the needed machinery and capital from France. The big hammer to be used is to be made by the firm. Superintendents are employed under the contracts with the Creusot Works, but a large force of French workmen has not been employed to do the work. The gun steel and armor are to be manufactured by American workmen, and a new industry is to be established in a manner to which no exception can be taken by the staunchest friends of home industries.

The Galveston *News* has the following in reference to the car-wheel works at Houston, Tex.: "Some months ago the *News* stated that land had been purchased on the north bank of the bayou, near the depot of the Texas Transportation Railway, for the purpose of building a railroad car-wheel foundry. The ground was bought, but the stockholders were delayed in their work of building through matters that were not easily overcome, but were subjects of law or arbitration. Everything being now clear, Civil Engineer W. E. Wood and his assistants were to-day busy laying off the ground The building will be made of corrugated iron, and will be on the banks of the bayou, where an extensive wharf will be built. Col. Dickinson, of the Marshall Car-Wheel Works, will superintend the construction of the works. From the above it will be seen that Houston will soon have another and a valuable industry to add to her already long list."

An agent of the Rutland Shirt Company has been in town (Brattleboro, Vt.) within a few days to look the town over with a view of removing the business of the company to this place, provided sufficient encouragement was offered. The company give employment to between one and two hundred women, and have the reputation of turning out a good article. It is understood that some of our leading citizens now have the matter under advisement.—*Vermont Phœnix.*

Machinists' Supplies and Iron.

NEW YORK, Oct. 6, 1887.

Iron—American Pig—There has been a moderate demand; the market has ruled quiet and steady; the business in progress developing no new or interesting feature. There has been but little disposition to buy in excess of immediate wants. We quote standard Lehigh and North River brands, $20.50 to $21.50 for No 1 X Foundry; $19 to $19.50 for No. 2 X, and $17 to $17.50 for Grey Forge, some brands of the latter being obtainable at $15.50 to $16.

Scotch Pig—We quote Coltness, $21.50 to $21.75; Glengarnock, $20.25 to $20.50; Gartsherrie, $21 to $21.25; Summerlee, $21 to $21.50; Eglinton, $20; Langloan, $20.50 to $21; Dalmellington, $20 to $20.25; and Clyde, $20 to $20.25.

Lead—The market has ruled quiet, but firm. Car lots to the extent of 150 tons have sold at 4.45c. to 4.47½c; and for round lots there have been buyers at 4.40c., with sellers asking 4.50c. to 4.55c.

Antimony—The demand continues moderate. We quote Hallett's, 8¾c., and Cookson's, 9c.

Copper—The market has ruled dull. Spot Lake is held at 10½c., and futures at 10.55c. to 10.75c., October to December bids being 15 to 20 points lower.

Spelter—We quote Domestic, 4.50c. to 4.70c.; refined, 5.75c. to 6c.; and Silesian, 4.90c. to 4.95c.

Tin—We quote jobbing lots Banca, 23½c. to 23¾c.; Straits and Malacca, 23.60c. Billiton, 23¾c. to 23½c.; Australian, 23.60c.

WANTED

"Situation and Help" Advertisements only inserted under this head. Rate, 30 cents a line for each insertion. About seven words make a line. Copy should be sent to reach us not later than Wednesday morning for the ensuing week's issue.

Situation wanted by an experienced pattern-maker foreman; best references. Box 62, AM. MACH.

Wanted—A blacksmith, experienced in drop and machine forging, to take charge. Address, stating experience and wages expected, Foreman, Box 64, AM. MACHINIST.

Twelve years' experience as practical machinist; one and one-half years as draftsman; would like situation as foreman or assistant supt.; good references; South preferred. Thorburn, AM. MACH.

✢ MISCELLANEOUS WANTS. ✢

Advertisements will be inserted under this head at 35 cents per line, each insertion.

Crescent Boiler Tube Expander: second to none; price in reach of all. Crescent Mfg. Co., Cleveland, O.

The Crescent Link Belt Coupling; something new; sample free. Crescent Mfg. Co., Cleveland, O.

Wanted—Second-hand indicator, in good order. Address Box 63, AM. MACHINIST.

Stationary boat engines, boilers, best, cheapest, 1 to 10 H. P. Washburn Engine Co., Medina, Ohio.

For sale, very cheap, a Roper hot-air engine, three horse-power, in first-class order. Hanzsche & Co., Baltimore, Md.

For Sale—One 6 H. P. upright steam engine, with governor, nearly new, by N. Y. S. E. Co.; cheap. D. Frisbie & Co., 112 Liberty st., N. Y.

Special tools and machines for mfg. designed and built to order; mechanical and Patent Office drawings. I. A. Weston & Co., Syracuse, N. Y.

Patent for Sale—Small tool used by machinists, carpenters, and general jobbers; endorsed by hardware dealers. D. A. A. Buck, 721 Chapel st., New Haven, Ct.

Wanted—To interest good, responsible parties in several mechanical specialties; investigation solicited, and best of references given. Address Specialties, AM. MACHINIST.

A. C. Christensen, 26 Church st., N. Y., mech. and hydraulic engineer, late chf. draftsman at H. R. Worthington; mechanical and patent drawings; patents of natural gas and water meters for sale.

If you are troubled with scale in your boiler, whether from lime, sulphur, iron, salt or other mineral or corrosive water, send for circular of Petroleum Resolvent, adopted on one hundred railroads. Contains neither alkali or acid, and costs but ten cents a week for the largest locomotive boiler. Pittsburgh Boiler Scale Resolvent Co., Pittsburgh, Pa.

W. C. YOUNG & CO., Worcester, Mass. Manufacturers of
Engine Lathes, Hand Lathes,
FOOT POWER LATHES, SLIDE RESTS, Etc.

BRADLEY'S HEATING FORGES.

ESTABLISHED 1882.

For Hard Coal or Coke. Indispensable in all shops to keep **Bradley's Cushioned Hammers** and men fully employed and reduces cost of production.

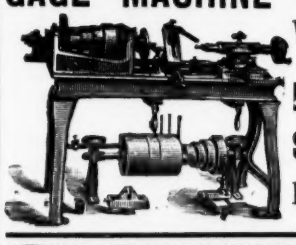
BRADLEY'S UPRIGHT CUSHIONED HELVE HAMMER

Established 1882.

Combines all the best elements essential in a first-class Hammer. Has more good points, does more and better work and costs less for repairs than any other Hammer in the World.

BRADLEY & CO. Syracuse, N.Y.

GAGE MACHINE WORKS, Waterford, N. Y.



Manuf'r's of FOX, TURRET AND Speed Lathes AND Brass Finishers' TOOLS.

STEPHENS PATENT VISES.

ONE-HALF TIME and LABOR saved by using this solid, strong, durable, firm-hold, quick-working Lever (Not Screw) Vise. Has improved Taper-Pipe and other attachments. Sold by the trade. Send for circular
TOWER & LYON,
95 Chambers Street, New York.
Successors to MELVIN STEPHENS.

STEAM HEATING FOR BUILDINGS,

Or, Hints to Steam Fitters. Being a description of Steam Heating Apparatus for Warming and Ventilating Private Houses and Large Buildings, with Remarks on Steam, Water and Air in their Relations to Heating. To which are added useful miscellaneous tables. By Wm. J. Baldwin. Eighth edition, revised and enlarged. With many illustrative plates. 12mo, cloth, $2.50.

"Mr. Baldwin has supplied a want long felt for a practical work on Heating and Heating Apparatus."—*Sanitary Engineer.*

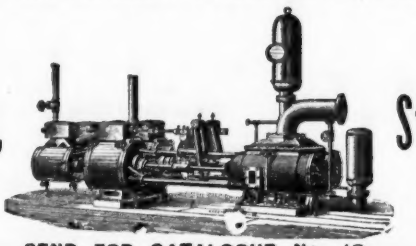
JOHN WILEY & SONS, 15 Astor Pl., N. Y.
Publishers of Scientific and Industrial Works.

*** *Will be mailed and prepaid on the receipt of the price. Catalogues and Circulars free by mail.*

GEO. F. BLAKE MANF'G. CO.
BUILDERS OF EVERY VARIETY OF

95 & 97 LIBERTY ST., NEW YORK. 111 FEDERAL ST., BOSTON.
WATER WORKS PUMPING ENGINES A SPECIALTY

THE DEANE STEAM PUMP CO., Holyoke, Mass.
BUILD AND
Water Works, Steam Pumping
ENGINES MACHINERY.



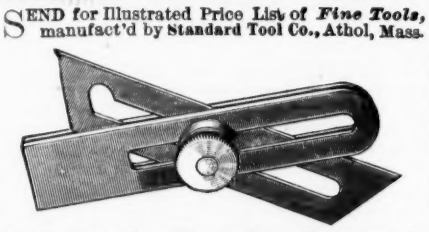
SEND FOR CATALOGUE No. 18.

IF YOU WANT A
SHAPER, PLANER, DRILL, LATHE OR SPECIAL MACHINERY,
WRITE TO
THE HENDEY MACHINE CO.,
SEND FOR A CATALOGUE. TORRINGTON, CONN.

RICE'S PATENT
Feed-water Heater and Purifier,
(WITH PUMP COMBINED.)
is guaranteed to be more economical than any other, and users say:
"It is all that you claim."
Send for Descriptive Catalogue.
FRANK M. CLARKSON,
Exclusive Sales Agent, Detroit, Mich.

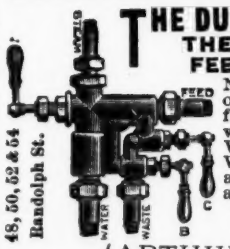
STEAM PUMPS for Hot or Cold, Fresh or Salt Water; for Oils, Naphtha, Tar; for Cane Juice, Liquors, Syrups, Scum; for Ammonia, Alkalies, Extracts, Acids; for Thick, Volatile, Viscous or Foul Liquids, etc. VACUUM PUMPS of the highest efficiency. FILTER PRESS PUMPS. Air, Gas and Acid Blowers. AIR COMPRESSORS. Etc. BUILT BY
GUILD & GARRISON, Brooklyn, N. Y.

SEND for Illustrated Price List of *Fine Tools*, manufact'd by Standard Tool Co., Athol, Mass.



Any Tool we make will be sent by mail or express to any address, all charges prepaid, on receipt of price.

THE DUPLEX INJECTOR
THE BEST BOILER FEEDER KNOWN.



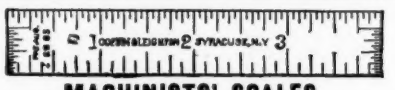
48, 50, 52 & 54 Bandolph St.

Not liable to get out of order. Will lift water 25 feet. Always delivers water *hot* to the boiler. Will start when it is hot Will feed water through a heater. Manufactured and for sale by.
JAMES JENKS & CO.
Detroit, Mich.

AGENT. ARTHUR APPLETON
45 Cortlandt St., New York.

NEW SELF-SETTING PLANE.
Sample sent as per Circular.
—MADE BY—
The Gage Tool Co.,
Vineland, N. J.

Fourth order from Widdicomb Furniture Co., Grand Rapids, Mich.: "Please ship us 7 No. 2 Smoothing Planes, one No. 11 Jack Plane, one 2-inch blade for No. 4 Smoothing Plane, and 6—1 2-4inch blades for No. 2 Smoothing Planes."



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PATENT END GRADUATION.
We Invite Comparison for Accuracy with all others.
EVERY SCALE GUARANTEED. SEND FOR LIST.
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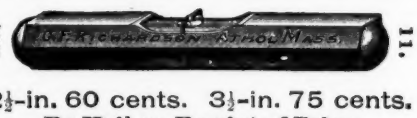

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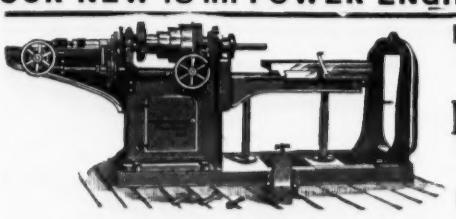

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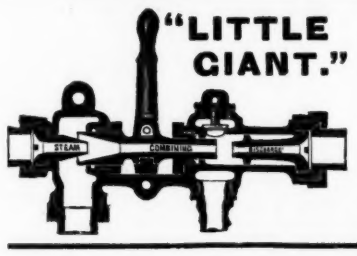

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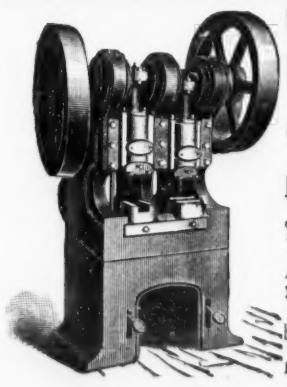

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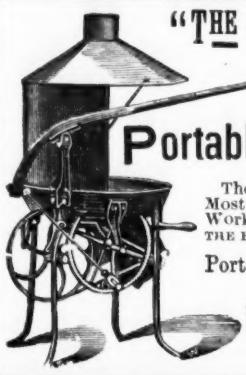

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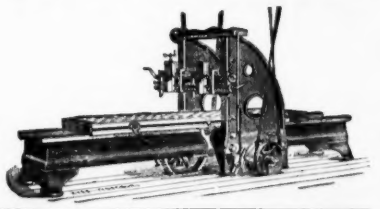

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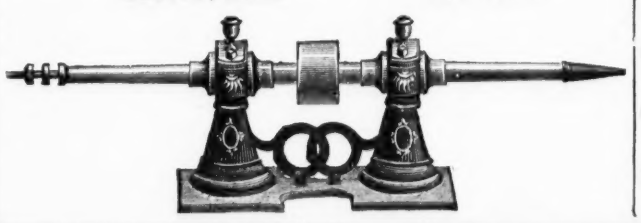

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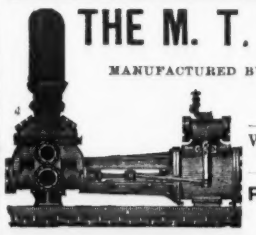

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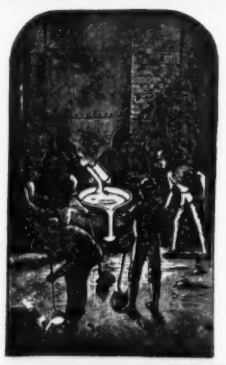

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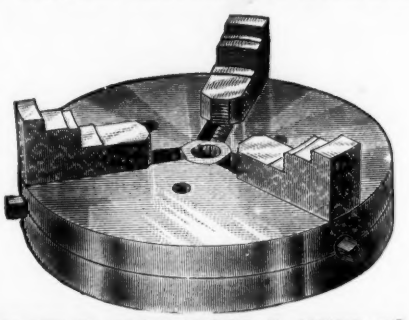
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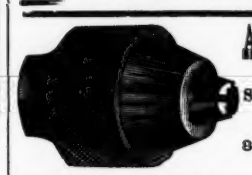
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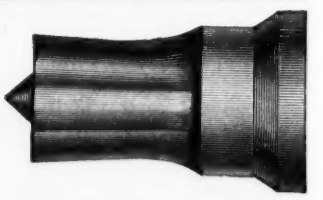

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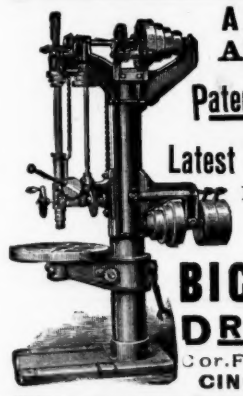

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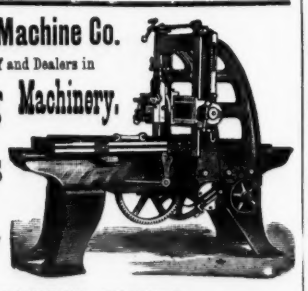

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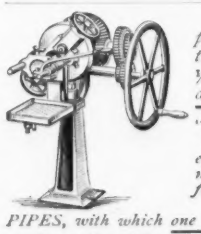

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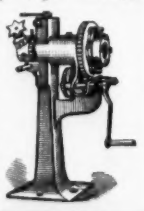

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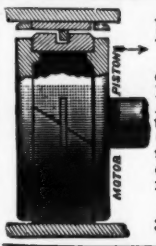

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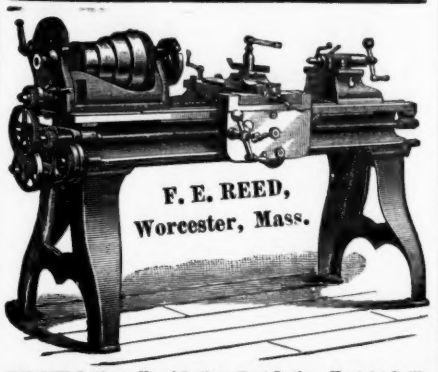

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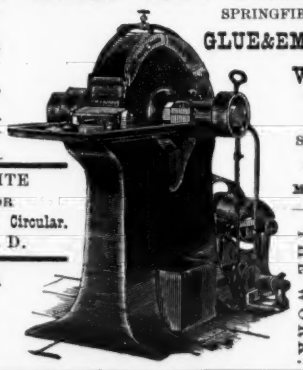

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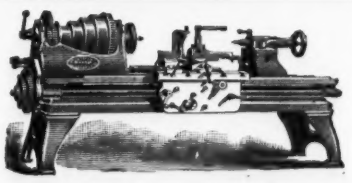

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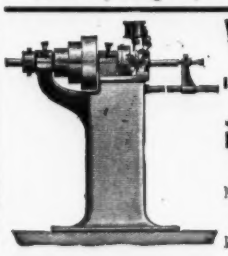

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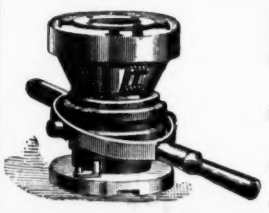

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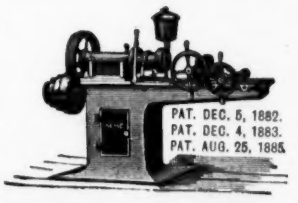

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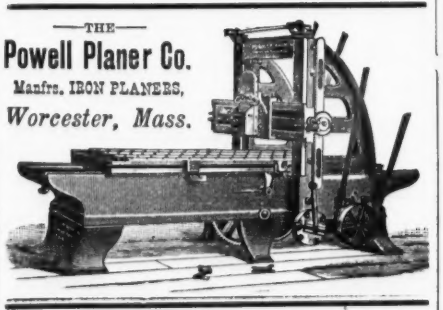

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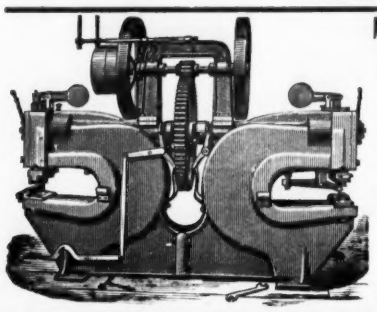

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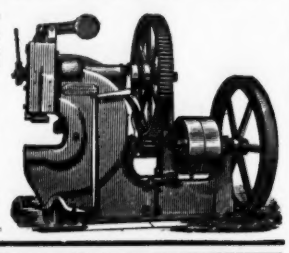

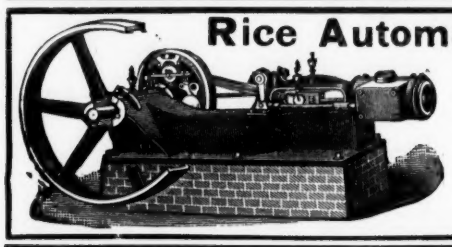

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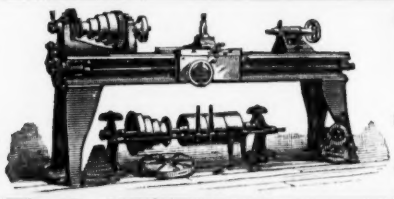

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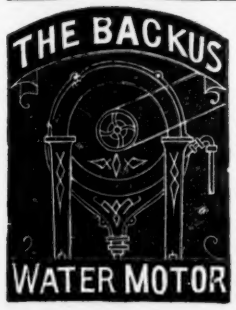

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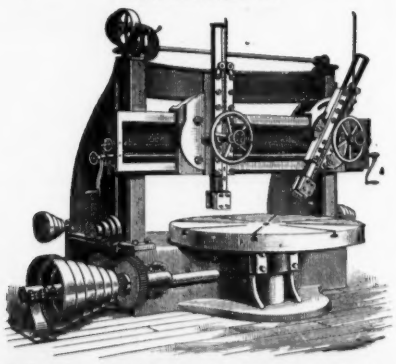

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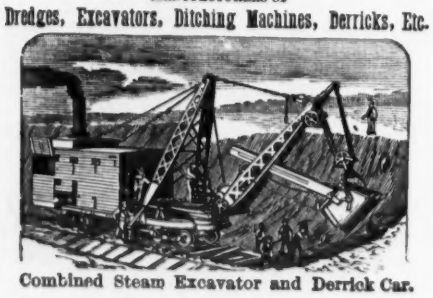

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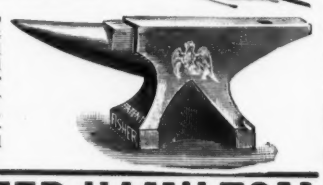

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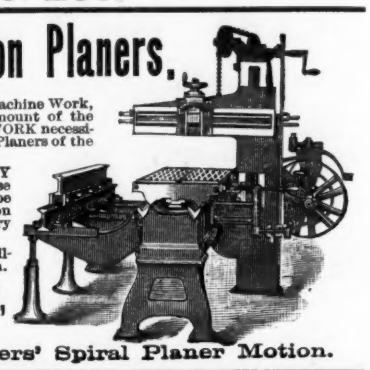

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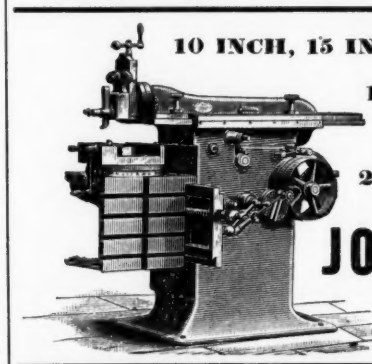

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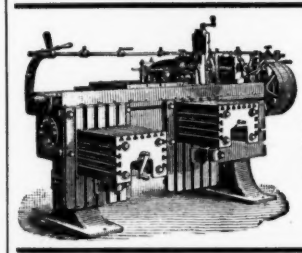

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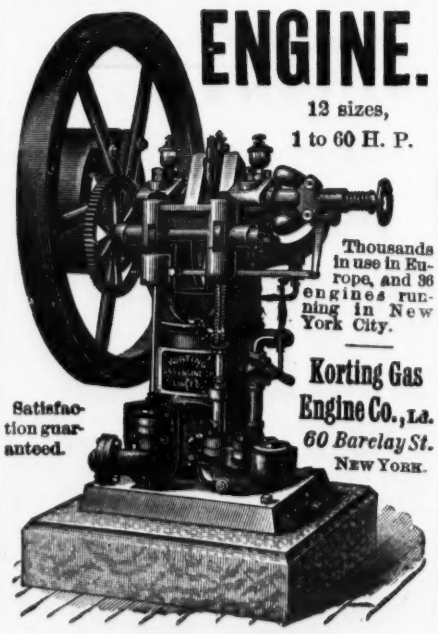

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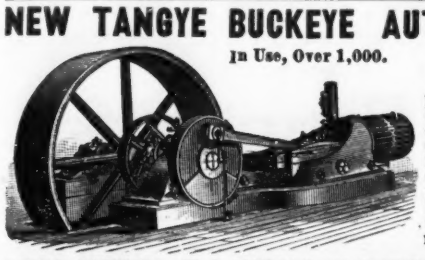

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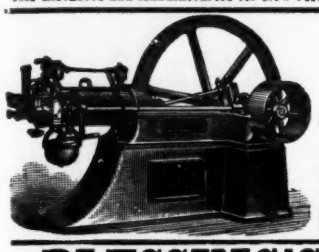

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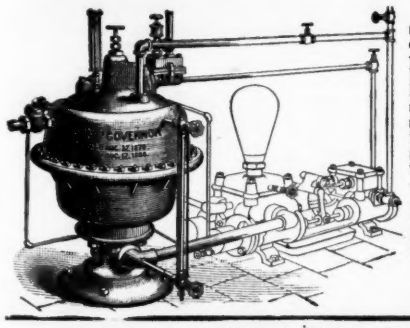

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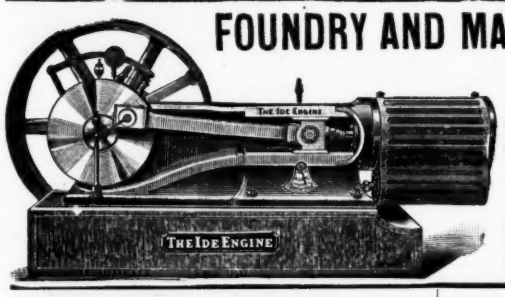

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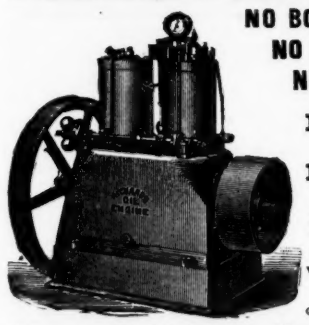

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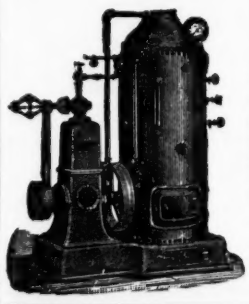

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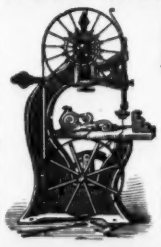

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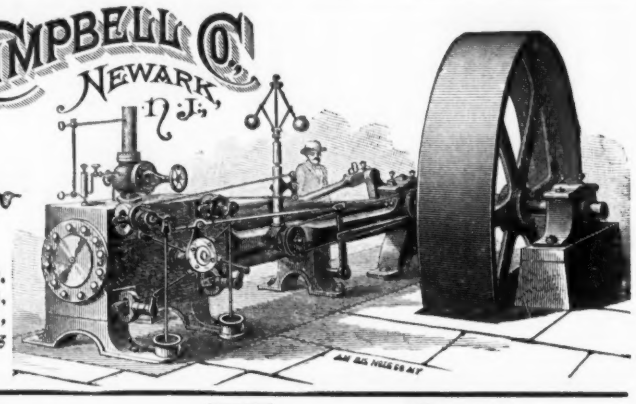

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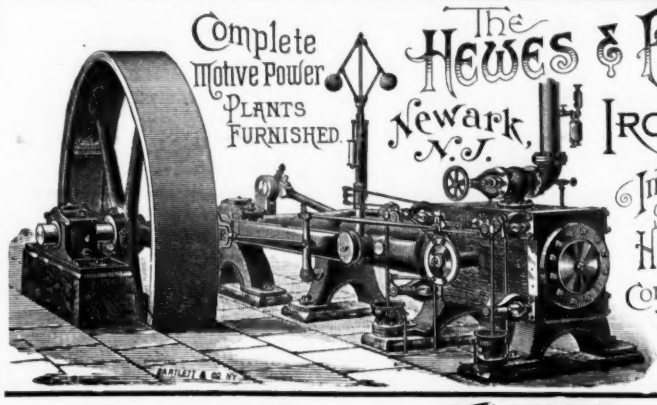

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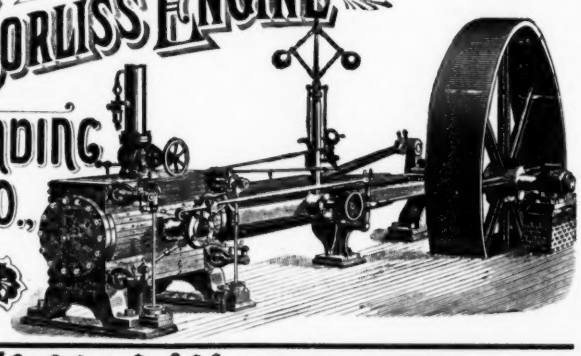

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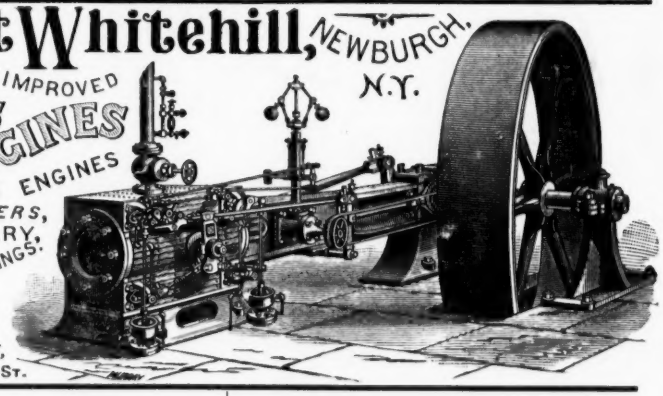

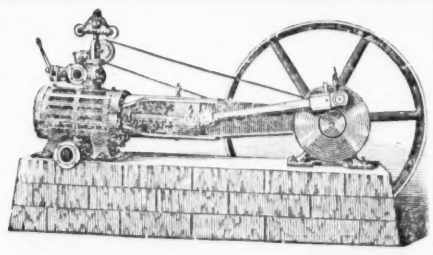

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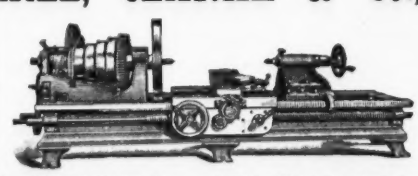

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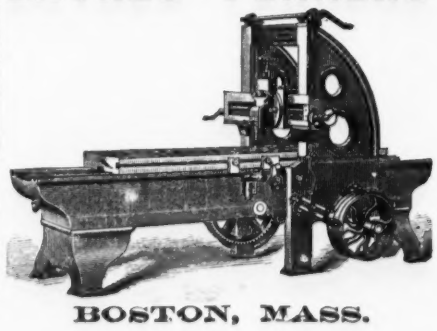

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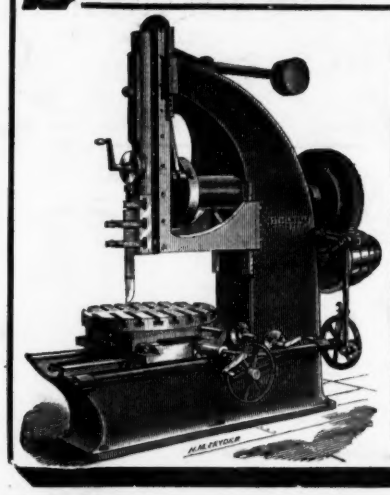

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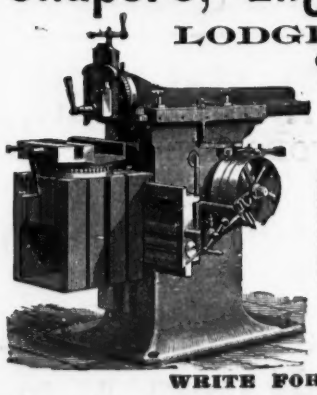

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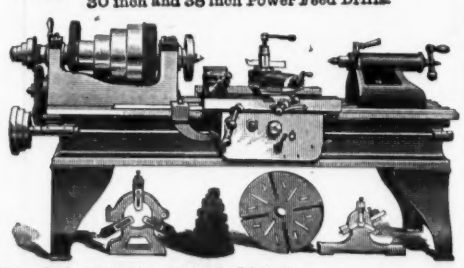

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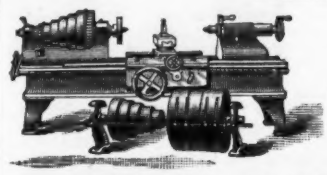

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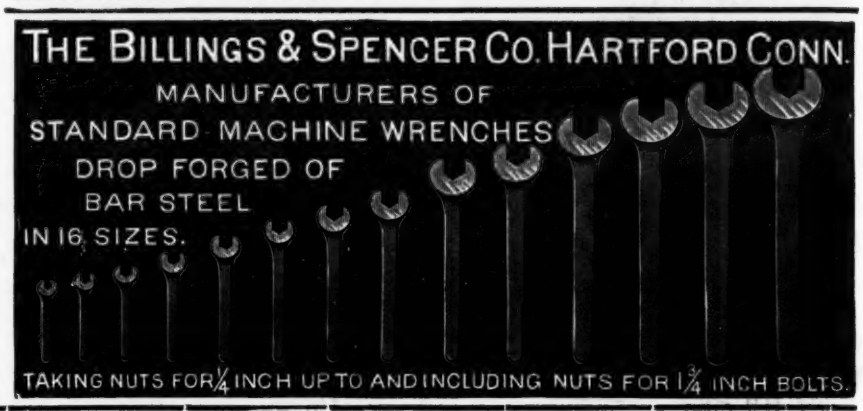

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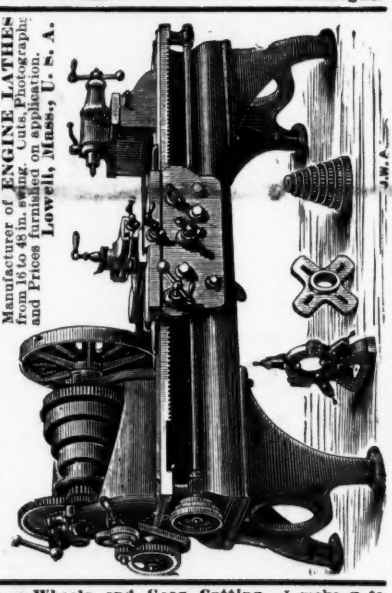

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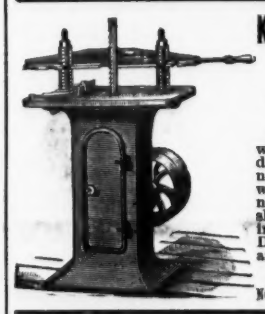

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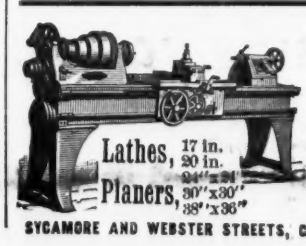

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